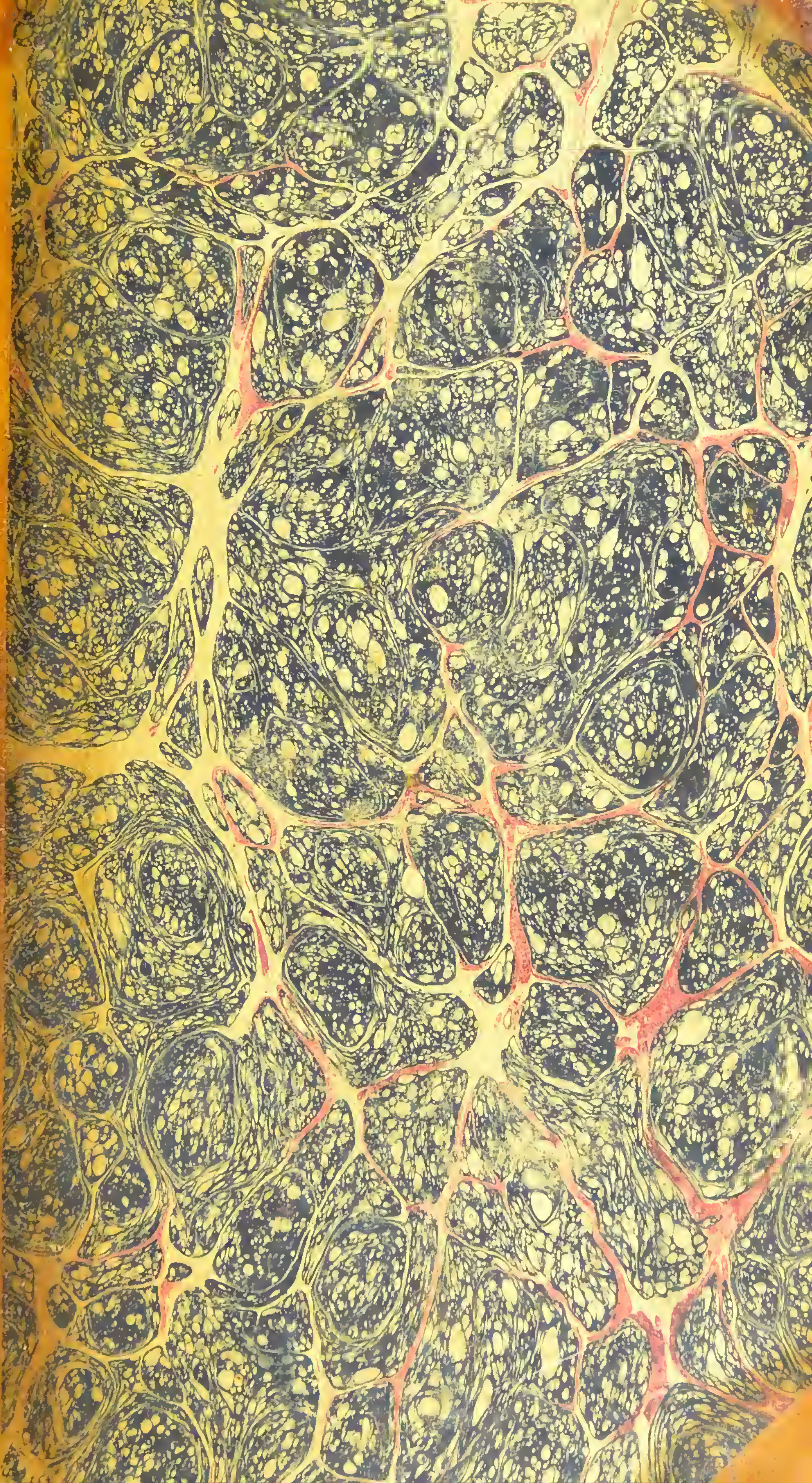

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Practical Inquiry

ON

DISORDERED RESPIRATION.

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A PRACTICAL INQUIRY ON DISORDERED RESPIRATION;

DISTINGUISHING

CONVULSIVE ASTHMA,

ITS SPECIFIC CAUSES, AND PROPER INDICATIONS OF CURE.

By ROBERT BREE, M. D.

LATE OF UNIVERSITY COLLEGE, OXFORD, AND THE UNIVERSITY OF EDINBURGH, &c. &c.

> "Quis diu expirat? Omnia corporis aut incommoda aut pericula per me transierunt: nullum mihi videtur molestius. Quid ni? Aliud enim, quicquid est, ægrotare est: hoc, est animam agere. Itaque, medici hanc meditationem mortis vocant."
>
> Seneca de Suſpirio, Epist. LIV.

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1797.

PREFACE.

In the following pages, we enter upon a ſubject as curious as any which noſology can furniſh. "Nothing," ſays Willis, "can be "more terrible than a paroxyſm of Aſthma. "The organs of reſpiration, which are the "pillars of life, are ſhaken to their foundation, "and the entire deſtruction of the animal "machine is apparently threatened."

Writers have generally ſpoken of Aſthma without preciſion, and the confuſion which has prevailed, may partly vindicate a more ſyſtematic arrangement of its cauſes. I may aſſume hopes of being uſeful from the opinion of Dr. Hebberden, which I apply to my perſonal acquaintance with the diſeaſe, in many year's of hard ſubmiſſion to its impreſſions.

According to his authority, "There cannot "be a more favourable opportunity of learning "the nature and cure of a diſtemper, than "when we meet with a caſe where the phyſician "has been always preſent with the patient, and "where he muſt be ſuppoſed to have paid due "attention to every circumſtance."

MED. TRANSACT.

A new Inquiry may embrace the aids of an enlarged knowledge of the function of reſpiration, of the recent diſcoveries in pneumatic medicine, and of the elucidation of laws which govern the motions of animated matter.

As to theory, I value it only as it exhibits indications of cure, which have not been ſufficiently, if at all, recognized in former pathologies of Aſthma. I have traced effects to particular, and to general cauſes, and I meet with analogy giving its ſupport to their connection. I may, therefore, form a ſanguine opinion of the *truth of the principles which I have applied, but my confidence is ſtill limited to the extent of their practical uſes.*

Whatever doctrine I have advanced, cannot be controverted without a ſupply of new ſcience, and humanity gaining by the diſplay of error. The old opinions were confeſſedly no guides to a ſucceſsful practice, of theſe, *I ſay experimentally, that they direct to a more certain prognoſtic, and to an improved method of cure.*

BIRMINGHAM,
JULY, 1797.

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354	—	22	—	orthodox	——	orthodoxy.
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PRACTICAL INQUIRY, &c.

PART I.

SECT. I.

The Pulmonary System.—Its Diseases.—Two States *particularly* affirmed, *inducing Phthisis and Asthma.*

THE lungs exactly fill the ſacs of the pleura in that cavity of the body called the thorax.

They are divided into right and left, and reſemble the figure of the ſacs, internally making a concavity which receives the heart.

The right is larger than the left, and is again ſubdivided into three lobes.

Betwixt the lungs and pleura, as in the pericardium, there is a ſerous vapour which is coagulable.

The external membrane of the lungs is continued from the pleura, and is ſpread all over them.

The internal ſtructure of the lungs is made up of lobes ſeparated by intermediate intervals, in which is a looſe cellular ſubſtance. Theſe lobes are divided and ſubdivided through a long ſeries, till at laſt they terminate in very ſmall membranous cells, variouſly figured, called veſicles.

Theſe air cells or veſicles freely admit the air from the branches of the trachea, or wind-pipe, and they are filled with air through this wind-pipe, and that only.

The wind-pipe begins at the larynx, and is made up of cartilaginous and muſcular rings, which are thin and elaſtic; flatter and thicker before, but thinner behind, where their extremities are united by ſtrong muſcular fibres, which complete the circle: but the lowermoſt rings within the lungs are leſs, and not ſo perfect.

Fleſhy fibres make alternately other rings: ſome of theſe are tranſverſe, others longitudinal, intended to leſſen the wind-pipe in its tranſverſe diameter, or its length: by this conſtruction of the rings, they are in ſome degree obedient to the will, like the external reſpiratory muſcles, and in expiration the ſecond ring of the bronchia enters within the firſt, the third within the ſecond, and the following always enters the preceding.

There is a cellular coat which ſurrounds the muſcular one, where are ſeated numberleſs ſimple glands, whoſe minute excretory ducts open like pores into the wind-pipe, and depoſit a limpid mucus in the cavity, which is not coagulable. Its uſe is to defend the ſenſible membrane from acrid particles floating in the air.

Internally the wind-pipe is lined with a delicate membrane ſmooth and irritable, continued from the mouth, and this likewiſe, as well as the muſcular coat, is ſurrounded with cellular texture.

About the third vertebra the wind-pipe is divided into two branches, which reſemble the trunk itſelf: each branch enters the lung with which it correſponds. Here the cartilaginous rings begin to change, and become more irregular circles, gradually taking into their conſtruction more and more membrane, and at laſt the terminations of the bronchia are merely membranous.

Theſe ultimate portions of the bronchia paſs the air into the veſicles, and receive the vapour exhaled from the arteries into theſe ſpaces, and paſs it off in expiration.

An artery and vein accompany the bronchia, ſometimes even three arteries, and two veins, through their ramifications, and occaſionally are known to inoſculate with the pulmonary artery and vein.

But the pulmonary artery and vein are the principal veſſels of the lungs, and the branches of theſe, with the branches of the bronchia, ſurrounded with cellular texture, pervade every part.

Upon the air veſicles the blood veſſels are ſpread and interwoven like the meſhes of a net. Here the capillary arteries exhale a copious vapour into the cells, and injections being forced into the pulmonary artery, flow into the wind-pipe, and, *é contra*, being forced from the wind-pipe, they paſs into the artery.

The lymphatics are very numerous in the lungs, and form a perfect network on their ſurface.

The pulmonary nerves are ſmall: they come from the eighth pair, from the recurrent, and from the cardiac. The nerves being ſo ſmall, the lungs have little ſenſation.

The quantity of blood paſſing through the lungs, is at leaſt equal to that of the whole quantity which paſſes through the reſt of the body in the ſame ſpace of time.

The uſe of the lungs is reſpiration, and to perform this function, the capacity of the cavity of the lungs muſt be encreaſed, that the external air may ruſh through the trachea, and reſtore an equilibrium which by this dilatation of the organ had been loſt by rarefaction of that fluid. Thus when the air which is always in the lungs, becomes expanded by the dilating of the thorax, its ſpring is weakened, and it makes leſs reſiſtance to the external air; which then enters, and the denſity of internal and external air is rendered equal.

To perform this operation of encreaſing the pulmonary cavities, the thorax is elevated by the contraction of the intercoſtal muſcles: by the action of the diaphragm, which preſſes down the abdomen, and relatively to the thorax, is then plane inſtead of convex. By this contraction of the diaphragm, reſpiration may be almoſt performed alone, and its force in dilating the breaſt is greater than that of all the other powers.

Without theſe united powers, the lungs have no inherent power by which they can attract air: but when any difficulty occurs to the exerciſe of the function, encreaſed powers are called into action, to remove it, as the muſcles inſerted into the thorax, ſcapulæ and clavicles: the ſceleni, trapezii, cervicales deſcendentes, ſerrati ſuperiores and pectorales, with the ſmall elevators.

In expiration, the elaſtic force of the bronchia and veſicles is made uſe of. They ſtrive to contract themſelves to expel the air, and thus aſſiſt the external force which is exerted by the muſcles of the abdomen.

But in extraordinary caſes, other muſcular powers are called upon to aſſiſt in expiration, as the ſacro-lumbalis, longiſſimus and quadratus of the back and loins.

By this plan it appears, that as ſoon as uneaſineſs is felt from the hindrance of the progreſs of the blood through the lungs, the expiratory powers are relaxed, and thoſe of inſpiration are excited, that the courſe of the blood may be free and quick through the lungs, which, in their collapſed ſtate of expiration, was obſtructed in its paſſage.

An important purpoſe of reſpiration is alſo to impart heat; and to give to the blood a quality, which in its courſe through the body is continually being diſcharged.

The acquiſition is oxygen, a component part of atmoſpheric air, which, being decompounded in the lungs by a chemical proceſs, furniſhes it to the blood by attraction through the fine and ſoft texture of the membrane of the air veſicles.

THIS ſyſtem is liable to ſuffer two principal diseases, which proceed from an alteration of the vaſcular ſtructure of the veſiculæ and bronchia. Theſe diſeaſes are the ſame in one veſicle as another, but every veſicle is not equally affected by them at the ſame time. It is ſufficient to ſhew the ſtate of one veſicle in each diſeaſe, and it will be readily comprehended how the lungs, which are a congeries of veſicles, may be wholly, or in part influenced by theſe diſorders.

The capillary blood veſſels are ſo ſpread on the membrane which makes the diviſions of the veſicles, and the veſicles themſelves, that they appear like a thick network of veins and arteries. The arterial capillaries are conſtituted as to denſity and tenacity of their coats, in proportion to the arterial branches nearer to the heart, and of courſe are ſuſceptible of the conſtitution, which is deſcribed under the character of Sanguine Temperament. If from the cauſes which induce Phthiſis, theſe capillaries are inflamed, the membrane of a veſicle will ſoon become dry; ſerum will be exhaled into the cell in quantity inſufficient to lubricate the lining, and the abſorbent lymphatics will drink up the little moiſture effused as faſt as it is beſtowed. A dry cough then comes on, which is not excited to relieve the veſicles of mucus, and no mucus is diſcharged, but it is the effect of irritation on the inflamed lining. In this ſtate the action of the veſſels is attempted to be diminiſhed by blood letting, and lubricating and ſaline demulcents.—It too often happens that the vaſcular action is reduced, but the local diſorder remains, becauſe theſe minute capillaries have been from ſome occaſional prediſponent cauſes, peculiarly adapted to aſſume inflammatory adheſion of their ſides and orifices. Here then is a ſituation in which phthiſis may be ſuſpended by evacuation of the veſſels, which will diminiſh the impulſe of the blood againſt their extremities, but cannot be prevented from eſtabliſhing itſelf unleſs the adheſion can be removed, and a healthy exhalation of lymph be reſtored. The ſlighteſt cauſes of fever, by accelerating the circulation, will become the exciting cauſes of phthiſis; the impetus of the blood will then only create new inflammation and adheſion in the parts of the arterial veſſels ſucceſſively more remote from their orifices. And the uſual condition of an inflamed part when it neither dies by gangrene, nor is reſtored to healthy function, ſupervenes upon the capillary as far as it is impacted from the exhalent mouth.

But if conſiderable evacuations have not been purſued to lower the vigour of vaſcular action, the inflammatory adheſion will be more rapidly eſtabliſhed, and proceed to a purulent criſis with greater ſpeed, hæmorrhages of red blood preceding ſuppuration, or attending it. In the beginning, therefore, the veſicle becomes the ſeat of a dry and inflamed membrane, next of purulent corruption of the ſubſtance of the capillary arteries which open into it, with red blood effuſed from the ruptured arteries in that part of their courſe where the adheſion of their ſides ceaſes.

This diſeaſe is called Phthiſis, depending on a ſtate of the capillary exhalents, the reverſe of laxity, which induces the other diſeaſe to which a veſicle of the lungs may be ſubject.

In habits of an oppoſite temperament, a veſicle of the lungs does not become dry; the numerous capillary orifices are not ſo ſuſceptible of inflammation, and fever very rarely attacks the ſyſtem. If pyrexia takes place, it may be traced to an accidental cauſe, and it does not readily induce hæmorrhage from the minute veſſels, nor inflammatory adheſion of their ſides. This difference is to be accounted for by the conſtitutional ſtructure of their coats, which are leſs thin, and more dilatable, and from many cauſes which affect the general ſyſtem, and which are to be explained hereafter. The capillary veſſels are therefore not affected in this diſeaſe with circumſtances either local or general which deſtroy their exhalent ſtructure, but they ſubmit to a progreſſive loſs of tone, and become unable to contract their diameter, from the ſtimulus of diſtending fluid. The fluid itſelf is deficient in properties which excite the vaſcular ſyſtem to contract in a ſtate of health, and external cauſes concurring, ſerum is effuſed into the veſicle in greater quantity than the abſorbents can regularly drink up, or reſpiration in its uſual exerciſe diſcharge. When the fluid has accumulated in this manner, it becomes, from irritation, the cauſe of convulſive Aſthma.

Theſe two are the moſt important diſeaſes to which the Pulmonary Syſtem is liable to ſubmit. They both ariſe out of the ſtate of the capillary extremities of the arteries which open into the veſiculæ and bronchia, but chiefly the former.

There are alſo in ſome habits, ruptures of the ſmall veins of the lungs, creating a diſeaſe which is ſeldom very difficult to be controuled if it is properly diſtinguiſhed; and there are ſtates of the lungs which are modifications of the two conditions of the veſicle above *affirmed*, ſometimes partaking of the nature of each, the capillaries of one veſicle, or one lobe, not having loſt their contractile tone, but being liable to be impacted by accidental cauſes; whilſt the capillaries of another veſicle, or another lobe, are in too relaxed a ſtate, and ſuffer the effuſion of too much ſerum. The conſtitution is then librating between Phthiſis and Aſthma, and gives an opportunity for various practice ariſing from contra-indications.

Phthiſis and Aſthma comprehend the features of every ſerious indiſpoſition which can generally attack the lungs, and they illuſtrate mutually the character of each. It will be found, that in their regular, ſimple, and uncomplicated forms, the remedies of one are the exciting cauſes of the other, and the cauſes of the one are reciprocally the remedies of the other. Phthiſis is more fatal in its iſſue than Aſthma, becauſe its tendency points to the deſtruction of the organ it attacks; and after a certain ſtage in its progreſs, medical treatment is oppoſed to its ravages without hope, and ſurely without ſucceſs. In Aſthma the omens are more propitious, and the object to be attained is worthy of every effort which judgment and reflection can direct.

This is the general proſpect of the ground of the ſucceeding obſervations, as they refer to that ſpecies of Aſthma commonly called ſpaſmodic or convulſive; *affirmed*, but not hypothetically, for it is believed that the experience of phyſicians has juſtified the outline; evidence from the animal œconomy, practical obſervation, and induction from facts, will be adduced in its further ſupport.

It will be convenient to precede the explanation of this form of Aſthma, by conſiderations on the ſpecies where the cauſe is more conſpicuous, and thus to illuſtrate the progreſs of further enquiry; but firſt it may be neceſſary to define the generic term of Aſthma, which ſometimes has been uſed in a very looſe ſenſe, at others limited with unneceſſary ſtrictneſs of application.

SECT. II.

Asthma a general name for disordered respiration.—The proximate cause.—Violent muscular action indicates irritation; *as in the stomach, gall duct, bowels.—Irritation in the pulmonary organ.—Difficultas spirandi, this term does not explain the natural fact; always to be referred to* irritation.—*A more precise idea of the instruments of excessive respiration.—Analogy of the perception of irritation in the lungs, and in the rectum and bladder.—Motus Medicati of Gaubius.*

ASTHMA, in its original or its degenerated meaning, long continued to embrace all the caſes of difficult reſpiration. If noſologiſts have attempted to confine the term to a peculiar form of this general affection, it is not conſiſtent with the comprehenſive view which will be taken of the diſorder here, to follow their example.

I ſhall recur to the definition of Willis, not finding in the interval of years, which have elapſed ſince his writings appeared, that the pathology of Aſthma has been in the leaſt improved. The practice has certainly not been more ſucceſsful, though diveſted of much encumbrance. “ Aſthma,” ſays this author, “ dicitur ab ασθμαινειν, (quod eſt anhelare, ſive “ difficulter reſpirare) et deſcribi poteſt, quod “ ſit *reſpiratio difficilis*, *crebra*, *et anhelosa*, *cum* “ *magna pectoris agitatione*, *et plerumque citra* “ *febrem.*”*

Frederic Hoffman gives the ſame latitude to the term in the following deſcription:

“ Hoc vero (Aſthma) ſecundum noſtram “ ſententiam nihil eſt, quam *impedita*, *et laboriosa admodun reſpiratio*, *cum ineffabili anxietate*, *et præcordiorum anguſtia juncta*, *liberum* “ *sanguinis per pulmones circuitum turbans*, “ *a variis causis suborta*, *periculi suffocationis* “ *non expers.*”†

Theſe authors adopted the Greek word as the head of a claſs of ſpecific varieties, and afterwards entered into diſtinctions of the ſeveral cauſes which, according to their obſervation, were productive of that uniform apparent effect “ difficult reſpiration.”

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* Thomæ Willis Opera Omnia. Genevæ, 1680. Tomus Poſterior, Caput. xii. de Aſthmate.

† Friderici Hoffmanni Medicin. Rationalis Syſtemat. Tom. 3. Sect. II. Cap. II. § II.

I ſhall imitate their method, and define Aſthma in ſo general and ſimple a manner, that it may comprehend as many ſpecies of diſordered reſpiration as noſology may preſent, or medical experience incline to claſs under the name.

Aſthma *is an excessive contraction of the muscles of respiration, usually called difficulty of breathing, excited by irritation, and proceeding from various remote causes.*

Under this generic definition are comprehended all affections which diſorder reſpiration, by exciting an unuſual action of the muſcles exerciſed in that function. The influence on theſe muſcles being the ſame in kind, though diſtinct in quantity of force, from the irritation of a ſimple catarrh, to the ponderous offence of a vomica in the ſubſtance of the lungs. In the convulſive ſpaſmodic ſpecies the muſcles are contracted with more energy and violence than in any other, but the contractions in this caſe do not obey any law, nor aſſume any form which is not common to the extraordinary action of the ſame muſcles in milder inſtances of dyſpnæa.

The difficulty of aſſigning to a diſeaſe its true origin, will be conſiderably encreaſed by neglecting a ſtrict obſervation of the characteriſtic ſymptoms which diſtinguiſh it, but

Aſthma has met with the fate of being ſubjected to the caprice of hypotheſis and prevailing theories, more than any others whoſe appearances could be diſtinctly traced to a material exciting cauſe.

The particular irritation, which in diſorders of the alimentary canal had excited the convulſive contractions of the ſtomach or bowels, has been marked by phyſicians with ready and concurrent teſtimony of the impatience with which the animal œconomy ſuffers the ſlighteſt interruption of its functions. It is, indeed, agreeable to reaſon and philoſophy to infer, that in any violent exerciſe of a particular organ, the energy which is exerted in exceſs, is directed by nature to ſome ſalutary end. If a material ſtimulates, the coats of the ſtomach, by its acrid quality, or diſtending quantity, and impedes the regular digeſtion of food, that material muſt be ejected for the ſafety of the body, and vomiting is excited. If a gall ſtone impacts the duct, and prevents the diſcharge of bile into the bowels, the animal motions are encreaſed, and the exceſs of muſcular action is pointed to the removal of the irritating and obſtructing cauſe. If ſcybala are included in the cells of the colon, there is no tranquil and continuous periſtaltic motion after the hard maſſes of feces are perceived to irritate the coats of the bowel more violent, and even convulſive muſcular contractions ſupervene, and continue till the offending matter is diſcharged.

Irritation on the pulmonary organ is productive equally of violent effects, and draws into aſſociation the action of all the muſcles of reſpiration.

Such aſſociation of muſcular motions has lately been delineated with accuracy by Dr. Darwin, as a natural conſequence of the irritation of the fibre, and the appearance of their convulſive efforts by a law of the natural œconomy may be juſtly accepted as evidence of ſome injury to be repelled, or ſome offenſive matter to be diſcharged.*

Alexander Monro, ſenior, has not taken ſo diffuſe a range through the analogies of natural phænomena in animal life as the author of Zoonomia, but he perceived, and has ſtated the effects of ſenſitive aſſociation of muſcles for the relief of unneceſſary irritation as follows:

" Whenever the uneaſy ſenſation, pain, " is raised by the too ſtrong application of " objects, a ſort of neceſſity is as it were im- " poſed upon the mind, to endeavour to get

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* Vide *Zoonomia*, Vol. I. Sect. VIII. 3. and X. 2.

“ free of the injuring cauſe, by either with-
“ drawing the grieved part of the body from
“ it, as one retires his hand when his finger
“ is pricked or burnt; or the injuring cauſe
“ is endeavoured to be forced from the body,
“ as a teneſmus excites the contraction which
“ puſhes acrid feces out of the rectum. In
“ both theſe operations, a convulſive contrac-
“ tion is immediately made in the leſed part,
“ or in the neighbourhood of it; and if the
“ irritation is very ſtrong or permanent, the
“ greater part of the nervous ſyſtem becomes
“ affected in that ſpaſmodic or convulſive
“ way.”*

But if ſome phyſicians have applied theſe laws in inſtances where irritation has been obſerved and known to excite the phænomena of convulſive muſcular contractions, a particular conſideration of the cauſes which may offend the ſyſtem in the pulmonary organ, has been generally neglected. Though its action is critically important to the preſervation of life, and to the nice equilibrium of its dependencies. Hence the reſpiratory muſcles have been excited to the moſt laborious efforts, but in general caſes, comprized in one ſpecies of Aſthma, their action has not been aſſigned to the influence of an irritating cauſe, or the operation of an unuſual material diſturbing the function of the organ.

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* Alex. Monro, ſenior, on the nerves 66. k.

In another ſpecies of Aſthma, by the exiſtence of a vomica, or ſome oppreſſive inconvenience, the cauſe has been ſo undeniable as to preclude diſpute, but even here it has been the cuſtom to conſider the extraneous matter with too ſlight a diſtinction of the principle by which it offends, and rather to refer the dyſpnæa to a mechanical obſtruction, than by comprehenſive reaſoning to attempt the diſcovery of a common cauſe by which the effect may be explained, in conſiſtency with the ſimplicity of natural laws.

In the endeavour to claſs phænomena of uniform general appearance under one head, it will be neceſſary to examine them with greater preciſion than they may poſſibly ſeem to require. But preoccupancy of terms is an inſufficient proof of the character of a diſeaſe, though it may have inſpired popular confidence in the propriety of an eſtabliſhed name.

Aſthma is ſaid to be diſtinguiſhed by difficulty of breathing. "*Spirandi difficultas*,"* but it is neceſſary to underſtand in what ſenſe the term is to be taken.

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* Cullen. Noſolog.

It is certain, that when no unnatural irritation exiſts in the organ, its functions are carried on in the calmeſt manner, and there is neither excitement to full inſpiration, nor neceſſity of renewing, by one effort, the whole meaſure of air which filled the cavities. Reſpiration has frequently been ſo imperceptible in ſome conditions of the body, that obſervers have been uncertain whether life was not extinct.

The quantity of air inſpired is alſo different in different men, and in the ſame man at different times: hence philoſophers have varied in their accounts of the meaſure of air in each inſpiration.

Borelli* makes the quantity from 15 to 20 cubic inches in one ordinary inſpiration, whilſt Dr. Goodwin ſays, the greateſt quantity received in the ſame effort, is 12 cubic inches, expanded in the lungs to 14.

The quantity uſually expired is equal to 40 cubic inches, as ſtated by Meſſrs. Jurin, Hales, Haller, Sauvage, Menzies, &c.

Dr. Goodwin† informs us, that the air remaining in the lungs after complete expiration, is 109 cubic inches, and that the proportion of the dilatation of the lungs before and after a healthy inſpiration, is as 109 to 123.*

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* On the Motion of Animals, p. 119, 133.

† Connection of Life with Reſpiration, p. 27.

But according to Dr. Menzies,† the dilatation of the organ in the ſame circumſtances, is in the proportion of 179 to 219.

There is, therefore, in health, no determinate meaſure of the air conſumed in reſpiration within certain limits; and in diſeaſe, if the pulmonary organ is not excited by a ſtimulus extraneous to its ordinary functions, the reſpiratory muſcles are not called into any unuſual action, though the difference between the effort of "an *ordinary* and a *full* inſpiration, is as 14 to 200 cubic inches.‡"

The difficulty will then be ſaid to conſiſt in obtaining, at each inſpiration, a meaſure of air equal to 12 cubic inches, a ſum which is ſufficient for the ſyſtem in ordinary health. There is no proof yet, with how ſmall a portion of atmoſpheric air life may be ſuſtained, whilſt its purity remains at the uſual ſtandard. In ſleep the inſpirations are very infrequent, and ſometimes without any perceptible contraction of the reſpiratory muſcles, or elevation of the breaſt. But animals paſs whole winters in ſleep§, and emerge from it in ſpring with increaſe of fat, which, by Dr. Beddoes,* is attributed to the deficient inſpiration of oxygen. It is certainly an evidence that the animal œconomy will admit of great latitude, and preſerve its functions in exerciſe with a quantity of air inſpired much ſmaller than it is poſſible to aſcertain, or to fix by any limit.

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* Goodwin, p. 37. † Menzies on reſpiration by Sugrue, p. 32. ‡ Vide Dr. Goodwin, p. 32. note. § Haller Element. Phyſiolog. I. 39.

It is indiſpenſably neceſſary to allow this latitude as a law in the œconomy of life, or to revert to the doctrines of the old phyſicians, as the only adequate explanation of the extraordinary inſtances of apparent death and ſubſequent recovery.

Divers in the pearl fiſheries are ſaid to remain under water half an hour or longer. Diemerbroeck † relates an inſtance of a diver remaining in the ſea that length of time under his obſervation.

A ruſtic appeared to die of the plague, and after three days diſcovered no ſign of reſpiration or life, but on being carried to the grave recovered, and lived many years afterwards.‡

Inſtances of apparent death from drowning are numerous, and conſequent recoveries ſince the eſtabliſhment of the Humane Society are authenticated beyond ſuſpicion or doubt, to the honour of the patrons and members of that invaluable inſtitution.

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* Beddoes Obſervat. &c. on Obeſity, p. 107. † Anatomes, Lib. II. p. 464.

‡ Diemerbroeck Tractat. de peſte, Lib. 4. hiſt. 85.

Many curious hiſtories are extant of perſons rouſed from the tomb of death by accident or deſign, and may be ſeen in Diemerbroeck, Lib. II.—Joannes Mathæus Quæſt. Med.—Philip. Salmuth. Cent. 2. Obſ. 86, 87, 95.—Hildanus Cent. 2. Obſ. 95, 96, and other writers poſſibly indulging too much in romance.*

If ſuch circumſtances of ſmall reſpiration, or even, as it is alledged, of no reſpiration at all, have happened, who ſhall define the quantity of air eſſential to life?

It was the opinion of Galen,† that the heat of the heart was the cauſe of the neceſſity of reſpiration; becauſe the blood being propelled from its fountain in a condition too hot and rarefied for the uſes of the body, the refrigerating properties of atmoſpheric air were required to condenſe and cool it as it paſſed the lungs. This theory, however ſupported by authors of no inconſiderable weight ſince the time of Galen, has now yielded on the beſt grounds of experiment, to an oppoſite doctrine. The blood is proved to acquire its heat from reſpiration alone; and the heart, inſtead of being cooled by the refrigeration of external air inſpired by the lungs, derives its excitement from that ſource, and is enabled to tranſmit heat to all parts of the body.

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* Add to theſe facts, the curious relations of the diſcovery of living toads in the ſtems of elm and oak trees, by the Academy of Sciences of Paris, 1719, 1731.

† De Utilitate Reſpir. Cap. 3 and 4.

But if we have arrived at the truth, and corrected the errors of the antient phyſicians, the difficulty is conſiderably increaſed by the improvement, as far as the conſideration of the above curious facts extends. The freſh air is ſaid to be neceſſary whilſt the rarefied blood demands its refrigerating power from the heat of the heart being unimpaired; but if the heart is cooled, or its heat ſo diminiſhed that the blood flows through the lungs without the uſual tenuity, reſpiration is in proportion unneceſſary. This reaſoning, applied to the extraordinary caſes of animation ſuſpended, however falſe in principle, will explain the ſubject better than the modern truth. For taking ſimply the principle to which we aſſent upon conviction of experiment, that one final cauſe of reſpiration is to communicate heat to the blood, and excite the heart, by the preſence of oxygen, theſe qualities being denied, immediate death ſhould follow. It is ſcarcely ſufficient to ſay that death certainly does follow, when evidence has been given of the ſpark remaining alive from half an hour to many days interval, during the term of which they were not imparted to the ſyſtem. A Galeniſt would triumph at the pre-eminence of his reaſons for the preſervation of the flame. He would ſay, that by the circumſtances of the alledged caſes the heat was ſo diminiſhed in the different ſubjects as to take away the neceſſity of refrigeration by the lungs, that is of reſpiration; and that, until warmth was totally extinct life would remain without it. Such an explanation would apply to the caſes of all the hybernating animals, of perſons ſtrangled by ſubmerſion, divers, and thoſe whoſe excitability had been exhauſted by the plague, nervous fevers, &c. But it would oppoſe the principle of Galen in another place, where he ſays, "It is "impoſſible for a living animal not to reſpire, "and for a reſpiring animal not to live."*

I would apply theſe obſervations in ſupport of the opinion here advanced, that the œconomy of animal life admits of ſuch latitude in the application of exciting powers, and of ſuch gradation in its loſs of vigour from their abſence, that it is almoſt a queſtion if reſpiration could be meaſured too low to be inconſiſtent with its preſervation.

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* De Loc. Affect. Cap. 5.

Haller attributes to the act of expiration, ſuch a condition of the lungs as even obſtructs the circulation of the blood through them.

" In expiratione vero pulmo undique ur-
" getur, et in multo minorem, molem compri-
" mitur: vaſa ergo ſanguinea breviora quidem
" fiunt cum retractis bronchiis, eademque an-
" guſtiora nunc ſunt, ſiquidem pectus ſecun-
" dum tres ſuas dimenſiones arctatur."*

In this ſtate of collapſe recurring at every expiration we ſhould, at all events, find a diſtreſs for breath alternating with the inſpirations, if the freedom or difficulty of breathing was to depend very critically on the portion of air meaſured out of the atmoſphere, and received in the cavities of the lungs. This nicety is not acknowledged by the œconomy of the pulmonary ſyſtem in its ſimple and healthful arrangements, but as ſoon as the organ feels the inconvenience of unnatural compreſſion, the derangement aſſumes the character and force of irritation, exciting the muſcles into energy of action. If the compreſſion is external to the air cavities of the lungs, the reſpiratory labour will not be ſo great as if the cavities themſelves are obſtructed, and the peculiar diagnoſtics of periodic convulſive

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* Haller, Lib. VIII. Sect. 4.

Aſthma may not all be preſent, but dyſpnœa, comprizing a ſet of ſymptoms of the ſame indication, but inferior force, ſeldom carried into paroxyſms, but whoſe ſum of uneaſineſs is perhaps not leſs, ſupplies its place.

Whenever, then, a compreſſion of the lungs, or organic derangement irritates the organ, the effort which has been commonly called *difficulty of breathing* is excited, and fuller inſpirations become a natural means of relief. In the inſtance of hydrothorax, the compreſſion ariſing from an extraneous material, there is conſiderable dyſpnæa, but in the expiration of Haller the compreſſion being a natural operation of the ſyſtem is not attended with uneaſineſs, and ſcarcely with conſcious perception.

It is true there may be ſome difference in the degrees of compreſſion from the two cauſes, and I am aware that Dr. Goodwin conſiders the compreſſion of hydrothorax as influencing, in ſome inſtances, the pulmonary organ much more than the act of expiration can do. But here the object is not to enter into the diſcuſſion of the final cauſe of natural reſpiration, which that ingenious writer contends is not the dilatation of the lungs, but to eſtabliſh the diſtinction of free or laborious reſpiration ariſing out of the ſimple condition of that healthy organ, and its ſtate embarraſſed by any extraneous offence. I therefore ſatisfy myſelf with his conceſſion, that though in the ſtate of expiration there is not ſo great a change in the pulmonary veſſels, as is aſſerted by Haller, "it may be ſtill ſuſpected that the "pulmonary blood does not circulate with "proper freedom in all the different ſtates of "reſpiration; that in the ſtate of expiration "the current may be ſo much retarded, as to "occaſion an accumulation in the veſſels of "the right ſide of the heart, ſufficient to bring "on an interruption or ſuſpenſion of ſome of "the other functions*." But it is impoſſible to aſſent to the concluſion, that the ſame phænomena are to be expected in a ſtate of natural compreſſion from expiration, and in the extraneous compreſſion of artificial hydrothorax. Dr. Goodwin kept in view the condition of the blood veſſels and heart only in his experiments, but a relative condition cannot eſcape remark, as it muſt influence the capacity of the air veſſels, and externally the ſenſibility and ſympathy of the reſpiratory muſcles.

In producing artificial hydrothorax in dogs, "in all of them it brought on a conſiderable "difficulty of breathing, but no other apparent inconvenience."

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* Dr. Goodwin, Sect. 3.

Reſpiration is an act which is increaſed in almoſt all caſes of diſtreſs of mind or body. The firſt effort after recovery from ſyncope is that of a very deep inſpiration by which the blood accumulated in the pulmonary veſſels and the heart, and giving uneaſineſs to the lungs, is propelled through the veſſels.

The motions of reſpiration are excited by the paſſions, and very frequently expreſs their character. They are excited by irritation, and "by propenſities to remove pain; this laſt "cauſe of their excitement operates more fre- "quently upon them than on any other func- "tion."*

It is therefore concluded, that "difficulty "of breathing," in noſological, or in popular language, infers irritation in the pulmonary organ, and that it conſiſts in the extraordinary contractions of the reſpiratory muſcles; there being no data in exiſtence to prove that the functions of the animal ſyſtem will be ſtopped by the atmoſpheric air drawn into the lungs being diminiſhed to any ſpecific meaſure, however ſmall, in ordinary reſpirations.

But when irritation is to be removed from the organ, there is in the proceſs of deep inſpiration a natural inſtrument employed, becauſe whatever material is ejected in vapour, or in mucus from the trachea, the expiration which conveys it muſt be preceded by inſpiration as deep as the ſeat of the offending matter. Without this effect of diſengaging the lungs from offence, the convulſive breathing is excited without an object and without uſe.

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* Cullen Inſtit. Med. CXCV.

But there has not only exiſted this miſtake as to the final cauſe of extraordinary reſpiration; but ſome confuſion of ideas has prevailed as to the phænomena which are to be obſerved in Aſthma. The inſtruments which nature can alone call into action when the lungs are injured or oppreſſed, are the muſcles which act externally in expanding or compreſſing their cavities, for the purpoſe of inſpiring or expiring air.

The convulſions are therefore external to the lungs as far as any ſenſible phænomena point out irregular contractions of muſcles. It is not, however, inconſiſtent with the nature of the operations of the brain, that a miſtake ſhould have occurred as to the proper inſtruments excited by its influence.

Almoſt all the motions called *ſpontaneous*, are performed without our conſciouſneſs; in ſome, not only the muſcles themſelves, but the effects of them are unknown, and the will cannot therefore be ſuppoſed to interpoſe in directing the mode of action.*

The muſcles of reſpiration are ſuſceptible of ſpontaneous, as well as voluntary action, and the conſtant repetition of moderate reſpiratory motions introduces the more violent actions, frequently without a perceptible interval between the exceſs and common ſtandard of their contractions. When the exceſs becomes conſiderable it brings on aſſociated contractions of other muſcles, and the peculiar nature of the irritation, which all theſe contractions are to diſcharge from the internal cavities of the breaſt is felt with ſuch ſenſation of uneaſineſs as to turn the patient's attention entirely to that quarter. There may be the additional cauſe of ſuch ſenſation in constrictions of the bronchia correſponding with the external contractions, but of this ſtate there has yet been no proof.

The ſubject is illuſtrated ſtill more by adverting to an irritation in the inteſtinum rectum. All the attention of the patient is then turned to the excruciating teneſmus, but it is indiſputable that the violent periſtaltic action above the rectum, and the ſtrong contractions of the abdominal muſcles and the diaphragm, are the inſtruments to evacuate the offence, and alſo moſt materially occaſion or increaſe the pain in the portion where it reſts.

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* Monro on the Nervous Syſtem. Chap. XXVIII.

In the diſcharge of urine the chief perceptions is in the bladder, but if the muſcles which we have mentioned to act in expelling alvine feces, did not contract with great effort, the perception could not be ſo ſtrong, as the propelling the contents towards the neck of the bladder muſt precede the relaxation of the ſphincter. But the attention of the animal reſts upon the effect, and the particular ſeat of the cauſe of theſe efforts, although no motion is at preſent performed by the bladder. Afterwards by the uniform and ſteady contraction of its own muſcular coat the urine is expelled.*

Exactly this degree of perception of ſtimulus incites the actions of the reſpiratory muſcles when the lungs are to be relieved. And the mind appears to admit of the ſame degree of conſciouſneſs of the effect to be produced whenever the irritation may be ſaid to create *anxiety*, *distress for breath*, and *stricture about the sternum*. We have then conſciouſneſs ſufficient to ſatisfy the ſcruples of a Stahlian, if he were diſpoſed to deny the operation of the cauſe here aſſigned to Aſthma, but without the rational neceſſity of acceding to the importance of any mental deliberations on the evil endured.

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* Monro on the Nervous Syſtem, Chap. XXVIII.

The contractions are really *Motus Medicati*, as Gaubius frequently terms them in beautiful and juſt deſcription.

"Multifariæ autem, quibus corpus vivum "pollet, vires motrices, quum rebus nocivis "irritatæ ſemet exſerunt, præcipuum præ"ſtant vitæ ac ſanitati præſidium.—Inde "profluunt motus automatici, irregulares qui"dem multimodis, at ſæpe beneficentiſſimi, "certaque determinatione ad ſalutarem finem "tendentes; etiamſi mente nec imperante, "nec conſcia, et vel invita quoque, fiant, "hujuſque adeo conſilio nequaquam tribui "poſſint. His ſi careret homo, nulla vel "ſanitati conſtantia, vel morbo medela foret."*

For the further advance of this object of reſtoring health or averting evil, ſympathies are eſtabliſhed in the œconomy, which by their correſpondence rapidly excite a unity of deſign and effort in muſcles, primarily calculated for ſeparate duties. "Accedit partium "facultatumque conſenſus ac conſpiratio qua "mutuam ſibi open ferunt, aliæ aliaram vice

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* Gaubii Inſtit. Patholog. Medicin. 640.

" funguntur, ſanæque pro afflictis in motus
" medicatos ruunt; ut horum junctis viribus
" tanto minus reſiſtere imminens præſenſve
" morbus poſſit."*

It is very convincing that the muſcles of reſpiration may be habituated to the operations of this ſympathy, and excited to contract, by various and apparently diſſimilar ſpecies of ſtimulus. The diaphragm and abdominal muſcles are the natural and common inſtruments of official ſupport to three functions; that of reſpiration, of alvine evacuation, and of urinary diſcharge. They are alſo the common inſtruments of relief to theſe three functions when diſturbed by too much irritation. They act ſtrongly upon the bladder, upon the bowels, and upon the lungs. Such a communication of aſſiſtance creates ſome alliance between them and other muſcles which are not common to the exerciſe of the three functions, but which are more peculiarly appropriated to the ſeparate duty of ſerving one.

A repetition of contractions produces the habit and facility with which theſe muſcles from an irritation in any one of the three ſyſtems, unhappily proceed to involuntary exceſs of effort, influencing at once, reſpiration, digeſtion, and urinary excretion.

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* Gaubii Inſtit. Patholog. Medicin. 642.

SECT. III.

The nature of the Irritation *in Asthma; frequently manifest; sometimes obscure.—The* continued Aſthma *of Floyer from* manifeſt Irritation.—*Cases of irritation producing Asthma, assented to by medical authorities from their evident offence.*

IN ſome caſes of exceſſive reſpirative labour the nature of the irritation is declared by concurrent ſymptoms which admit of no ambiguous pathology, in many others phyſicians have declared their doubts, if not their ignorance, by reſorting to conjecture and theory, which have been ingeniouſly built on the baſis of abſtract hypotheſis, but which experiment has not yet confirmed, nor diſſection ever defended.

The caſes of manifeſt material irritation are enumerated by Dr. Floyer as one ſpecies of the Aſthma, which he calls *continued.*

This ſpecies of Aſthma is conſidered as ſecondary, and dependent on a primary diſeaſe, which is to be removed before the Aſthma will ſubmit. But there is ſome confuſion in this arrangement, becauſe the author places amongſt the cauſes of ſecondary Aſthma conditions of the habit which he allows to be ſymptomatic of the periodic diſeaſe, ſuch as the inflation of the colon and the ſtomach, which is always amongſt the ſymptoms which precede or attend the paroxyſm of Spaſmodic Aſthma.

It is uſeful however, to advert to the authority of Floyer, in his explanation of the cauſes of the continued or ſymptomatic Aſthma, becauſe he furniſhes a proof of the poſition which I attempt to eſtabliſh, that *certain inordinate contractions of the reſpiratory muſcles indicate the preſence of a matter offending the pulmonary organ, either by its oppreſſive bulk, or acrid quality, or both.*

It is not conſiſtent with my plan to dwell very particularly on theſe cauſes of Aſthma, but a general view may be taken of ſuch manifeſt and undeniable irritations as have been obſerved by practical authors, without any important delay in purſuing the other parts of the ſubject.

Hydrothorax occaſions Aſthma by the compreſſion externally of the air veſſels of the lungs,* and it is alſo too often the conſequence of Aſthma, when that diſeaſe is inveterate, and the hydrophic diatheſis has ſupervened on the local affection. Vide Carol. Piſo de Morbis ex ſero. p. 217.—Baglivi Praxis p. 107.—Goodwin on animal life and reſpiration, where is an example of this cause of Aſthma, artificially produced. Alſo Boneti Sepulchret. Anatom. tom. I. p. 515, 516, et inſequent.—Mr. Cruikſhank on the abſorbent ſyſtem, p. 116.—Morgagni lib. 2, Epiſt. XVI.

Similar to this cauſe of Dyſpnæa is the Hydrops Pericardii. Morgagni, Lib. 2, Epiſt. XVI.

An Empyema, abceſs or large tubercle: ſteatomatous tumor, &c. in the ſubſtance of the lungs or on their inveſting membranes.

Vide Jacob Wepſer, exerc. de apoplexia. Boneti Sepulchret. Anatom. Mangeti. tom. I. p. 352, 353, 498, 499, 500, &c.—Columbus Lib. XV.—Car. Piſo de morbis a ſero, ſect. 3, Cap. 4.—Baillie's morbid anatomy, p. 46, et inſeq.

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[*] Vide Haller, ad Boerhaav. Prælect. §, 102. not. 17.

In the inſtance of a vomica* there is no diſtinction to be obſerved, between the manner in which nature attempts to eject it from the lungs, and the efforts which are diſcovered in the laborious breathing of ſpaſmodic Aſthma, to diſcharge the irritating cauſe of that diſeaſe; after a ſlight cough a difficulty of reſpiration comes on, which takes the form of a regular paroxyſm of Aſthma in many caſes, but in all aſſumes a violent energy at intervals. T. W. has been ſeized with theſe ſymptoms at the approach of two ſucceſſive winters, and they terminated by the rupture of a vomica, which in the firſt illneſs was many weeks before it broke, in the ſecond not ſo long, nor was the diſcharge ſo large; in the interval he was in his uſual health; this preſent winter he has again ſuffered the diſeaſe, and I have had an opportunity of accurately aſcertaining its phænomena. The difficulty of breathing commenced after expoſure to violent heat, and the vapour of aquafortis in refining gold, a ſlight cough, but interrupted and uſeleſs, attended the dyſpnœa; in a few days he perceived an increaſe of dyſpnœa, and great flatulence of the ſtomach, then a paroxyſm of laborious reſpiration came on in the evenings, which prevented his continuance of ſleep, and returned every night with the regularity of periodic Aſthma, from which an ordinary obſerver could not in the leaſt diſtinguiſh the diſeaſe, but the difference was to be remarked by attention to collateral ſymptoms; the pulſe was full and hard as in other inflammations, and a pain not pungent but oppreſſive was felt where the diſeaſe lay. In the progreſs of the diſorder the expectoration of fetid pus in large quantity declared the nature of the inconvenience which irritated the pulmonary organ.

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* Tulpii obſervat. med. lib. 2. cap. x.—Jodoci Lommii Medicin. obſervat. lib. 2. Hippocrat. lib. 4. epid. 6—4.

Bartholine* gives a very fortunate inſtance of the cure of a ſecret vomica, exciting Aſthma, and wearing away the body. The patient was wounded by a ſword in a duel, the point paſſed between the ribs and opened the ſac. The effuſion of pus was attended to, and the patient was reſtored to health. A brave officer was ſhot through the lungs at the battle of Quebec, and was cured of his wound, and an Aſthma at the ſame time. It is probable ſome organic derangement was removed as in the caſe related by Bartholine.

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* Hiſtor. Anat. 14. Centur. 6. vide Fernelius Patholog. Lib. V. Cap. X.

Polypous concretions in the ventricles of the heart, and pulmonic veſſels, are conſidered by Hoffman as a frequent occaſion of difficulties of breathing. In his Conſultations he appears to extend the influence of this ſtate much farther than the general reſult of Aſthmatic Paroxyſms will juſtify. However, diſſections have notwithſtanding proved that this condition often prevailed, but in ſome inſtances if not in all, it may be ſuſpected to have been rather the conſequence than the cauſe of Aſthma. See Tulpius Lib. 1. cap. 27.—Riverius Centur. I. obſ. 82.—Bartholin de Lact. Thoracic. Cap. XIV.—Malpighius de polypo diſſertat.—*Bonetus tom. 1. p. 128, 130, 527, 528, et inſeq. Willis de Affect. Hyſtericis et Hypochondriacis.—Morgagni Epiſt. XV. XVII. XXIV. XXVI.

Aneuriſmal enlargements of the heart and of the aorta; oſſifications, earthy depoſitions and alterations of its ſtructure, are treated of in Dr. Baillie's morbid anatomy of the human body. Morgagni Epiſt. XVII. XXIV. XXVI.

Calculous concretions in the trachea, and in the ſubſtance of the lungs have been met

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* Bonetus Mangeti, Lugduni, 1700.

with; alſo earthy and bony ſubſtances.--Baillie's morbid anatomy, chap. iv.—Morgagni Lib. II. Epiſt. XV. et inſeq. Epiſt. XXIV.—Diemerbroeck Anatom. Lib. II. p. 443.—Bartholin. Anatom. reform. l. 2. c. 9.—Kerkringius Obſ. Anat. XXVII.—Boneti Sepulch. Anatom. tom. 1. p. 485, 501, 502.—Fabric. Hildanus, Cent. II. Obſerv. 29.—Miſcell. Curioſ. Anni. 1671, Obſerv. 181. In this latter inſtance there is the remarkable aſſertion that reſpiration was not affected. Platerus Pract. lib. I. ſect. 2. c. 4.—Schenkius Obſ. Med. Rar. lib. 2.—Boerhaave Prælect. in Inſtit. § 835.—Morton. Phthiſiolog. lib. 3. cap. 6.

Bones and other hard ſubſtances have paſſed down the trachea, and created certain Aſthma. Tulpii Obſ. Lib. 2. cap. 7.

Concretions have been coughed up of different kinds, ſo large as to create aſtoniſhment in the relaters. Koehlerus* ſpeaks of them as very large. Morgagni ſaw one expelled by cough as big as a peach ſtone. Œthæus† deſcribes one as large as a walnut coughed up by a girl of fourteen.

Carcinomatous tumours have been diſſected from the trachea. Bonet. Sepulch. Anat. Tom. I. p. 485.

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[*] ommerc. Litter. A. 1741.

[†] Vide Schenkius ad loc. cit.

Oſſifications of the pleura, vide Baillie's Morbid Anat. p. 40.

The rings of the trachea have become more or leſs oſſified, the cartilage being converted into bone. In this caſe, ſays Dr. Baillie, "the mucus will not be ſo readily expelled by coughing, as the expirations cannot be ſo forcible."* See Morgagni, epiſt. XV.—Tumours in the trachea have been often remarked.

Fat or a tumour of the thymus gland. The thymus has been known in ſome inſtances not to diminiſh as the ſubject advanced in years; in others it has even encreaſed from diſeaſe. Boneti Sepulch. Anatom. tom. I. p. 486. 504.—Baillie's Morbid Anatomy, p. 73.

Gibboſity is a well known cauſe of difficult reſpiration. This irritation being permanently and rigidly fixed, either in the ſternum or ſpine, the diſeaſe is inveterate as the cauſe.†

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* Morbid Anatomy, p. 59.

† Mr. Cheſher, of Hinckley, in Leiceſterſhire, by the adoption of juſt principles, and the moſt careful practical deductions from his obſervations and experience, has attained aſtoniſhing ſucceſs in treating many hopeleſs caſes of gibboſity.

Lommius* ſays, if a perſon becomes gibbous before puberty in conſequence of Aſthma, he dies; in which he follows the prognoſtic of Hippocrates Aphor. 46. ſect. 6. but it is highly probable that Aſthma is the conſequence of the gibboſity, or at leaſt of an unobſerved alteration in the ſtructure of the ſpine or ſternum, which may irritate or diſturb the function of the lungs in ſeveral ways, before it acquires the term of gibbous. Theſe authors have in that caſe ſubſtituted cauſe for effect.†

An ulcer in the ſternum from a removal of an excreſcence, has been followed by Aſthma. See Hoffman de Aſthmate et Conſult. et Reſp. Med. Hildanus Cent. 6. Obſ. 74.

Adheſions of the lungs to the diaphragm, pleura and pericardium have been frequently found by diſſection; theſe are conſequent to inflammation, and it is obvious that Aſthma may attend this organic alteration. Bonetus tom.

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[*] Jodoci Lommii Obſ. Med. lib. 2. p. 140. Millar on the Aſthma, p. 114. Gliſſon de Rachitide.

[†] The aphoriſm of Hippocrates creates conſiderable confuſion in its ordinary interpretation.—Severinus (lib. de Abſceſſibus) propoſes a reading which clears the difficulty and makes the ſenſe more conſiſtent with the opinion above delivered, and with the probable meaning of Hippocrates. For ἐξ read ἔξω and the paſſage will ſtand thus, ὁκόσοισι ὕβοι ἔξω ἄσθματος, ἢ βηχὸς γίνονται, &c. ἔξω ſignifies *præter* as well as *extra*. The ſenſe will then be "qui præter anhelationem et tuſsim gibbiquoque fiunt, eos ante pubertatem mori." See Bonet. de Gibboſitate.

I. p. 509, 512.—Bontius Med. Indor. Obſerv. VII.—Willis Pharm. Rat. part 2, ſect. 1, c. 8. —Hippocrat. Lib. 2. de morbis pulmon. &c. Morgagni Epiſt. XVI.

Theſe adheſions are ſaid by Diembroeck to be found in one third of the ſubjects opened. Tulpius affirms that the lungs in very few bodies are entirely free from ſuch appearances.

The ſtraining of the lungs by running is mentioned by Floyer, by which injury may happen to the membranes or fibres in the interſtices of the air cells. Violent exerciſe produces anhelation, which will be explained, but it is difficult to comprehend any organic leſion productive of a continued Aſthma, or at leaſt it is not to be underſtood from Floyer's deſcription.

Flatus in the colon and ſtomach are never abſent in the ſpaſmodic Aſthma, and if ſuch a ſtate of thoſe viſcera is attended with continued dyſpnæa, the diſeaſe can only be accounted a variety of the other ſpecies, in which it will appear that the periods of intermiſſion of the affection are very uncertain, and ſometimes are loſt in the advanced ſtages of the complaint, or when it is complicated.

Tumours of the lower viſcera, ſchirrous hydropic, ſteatomatous, or flatulent, mechanically produce Aſthma by impeding the deſcent of the diaphragm. They are alſo a part of the cachexy which prediſpoſes to the diſeaſe not uncommonly. Inſtances are numerous in practical authors of the mechanical inconvenience of ſuch cauſes. The gravid uterus is a very general occaſion. Aſcites and Tympanites produce the ſame effect. Dr. Ferrier* has a curious inſtance of tympanites, in which the omentum was found lying in a ſac formed in the diaphragm, on the right ſide of the thorax; Aſthma was an inevitable ſymptom of ſuch a ſituation of the viſcera.

Fat and ſteatomatous tumours have adhered to the diaphragm.—Vide Veſlingius Syntagma. Anat. Cap. 9.—Kerkringius Obſ. Anatom. 89.

And alſo to the pleura and mediaſtinum. Boneti tom. I. p. 533, et inſeq.

The liver has been found of an enormous ſize by many practitioners. Bonet. tom. I. p. 537 et inſeq. And Aſthma is very frequently ſymptomatic of the diſeaſes of this viſcus and of the ſpleen.

The diſeaſes of the meſentery and omentum, if they give occaſion to the altered ſtate of the liver and ſtomach are cauſes of Aſthma. Joh. Rhodius Cent. 2. Obſerv. 25.—Guern. Rolfinkius Diſſert. Anat. Lib. 1. Cap. 13.

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* Med. hiſt. and reflect. vol. I. p. 41.

The liver has been united by adheſion to the diaphragm and lungs. Diemerbroeck Anat. Lib. 1. c. 13.

An hydropic patient was opened in my preſence, and the liver was found to contain a large ſac of hydatids, which was connected by adheſion to the ductus communis; before this perſon ſwelled in the abdomen, he had been for ſome time aſthmatic, and the bile was not paſſed regularly into the duodenum. Flatulence of the ſtomach was predominant, and the diſeaſe appeared to wear moſt of the ſymptoms of ſpaſmodic Aſthma. Worms have been found by anatomiſts in different ſituations in this viſcus.*

The abſorbent glands in the poſterior mediaſtinum are ſubject to enlargement from ſcrofula. When this affection is conſiderable it neceſſarily produces ſome difficulty of breathing by preſſure on the lungs and trachea.† The ſame glands near the trachea occaſionally are converted into bony or earthy matter, and preſs the paſſage.*

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* Vide Lieutaud tom. I. p. 194.

† Baillie's morbid anatomy, p. 71.

Diemerbroeck† relates that he ſaw a live worm coughed up from the lungs of a woman; and has obſerved theſe animals by diſſection in the veſiculæ of the lungs. He infers that they muſt have been bred in theſe cells, for if they had inhabited the bronchia ſuffocation would have been the conſequence, and the moſt violent cough and Aſthma. If they were inhabitants of the cells at the extremities of the bronchia, it muſt be believed that Aſthma would be equally inevitable, though not ſo ferocious and acute, becauſe the irritation would certainly be leſs.

Aſthma has certainly proceeded from hydatids in the ſubſtance of the lungs, on the pleura, diaphragm, and even the ſurface of the heart. The ſudden rupture of theſe hydatids has produced immediate ſuffocation.‡—Car. Piſo de morbis a ſero Sect. 3. Cap. 7.—Boneti Sepulchret. Anat. tom. I. p. 498. 499.

For a curious caſe of the dilatation of the lower part of the pharynx by which a pouch was gradually formed, ſtopping the paſſage of the œſophagus. See Med. Obſervat. vol. 3. p. 85.

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* Baillie's morbid anatomy, p. 72. † Lib. II. p. 442.

‡ Vide Ottonem Heurnium obs. 18.—Bartholinum, Cent. II. obs. 61.

The ſternum and the cartilaginous ends of the ribs have become oſſeous, and not under the controul of the muſcles of inſpiration. Bonet. tom. I. p. 533, and Platerus Praxis. Lib. I. Cap. 4. Here is a caſe of Aſthma analogous to any other form of gibboſity.

The mal-formation of the enſiforme cartilage, by being turned inwards as if artificially depreſſed, is productive of hepatitis and chronic affections of the ſtomach in a young lady now under my care. Diemerbroeck has particularly noticed the inconveniences from this cauſe. Lib. 9. Cap. 14.

Bartholine* alledges the effuſion of chyle to be a cauſe of aſthmatic affection, in this caſe he ſuppoſes the rupture of a duct.

An extreme dryneſs of the parenchyma of the lungs has been well aſcertained. Rhodius† aſſerts that it has been occaſioned by the profuſe uſe of the decoction of guaiacum wood.

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* Specileg. 2. de Vaſis Lymph. cap. 2.

† Cent. II. obſ. XXI.

Avicenna had remarked the condition to ariſe from the hot vapour of furnaces and metallic fuſions. The ſymptoms are waſting of the fleſh, ſmall and frequent reſpiration, continued thirſt, and little ſpitting. The remedies moiſt and demulcent.

Heurnius* ſaw the lungs of a printer ſo altered as to almoſt appear like a dried apple.

Conſiderable deficiencies of ſubſtance have been diſcovered by diſſection in the pulmonary ſyſtem. Vide Senac Traité du Coeur, L. IV. c. 3.—Haller's Opuſcul. Patholog. Obſ. 17.

The mediaſtinum, and even the diaphragm with a large portion of the lungs, have been wanting. Diemerbroeck Anatom. L. I. c. 13. This defect was imperfectly ſupplied by adheſion of the liver to the only lobe of the lungs which appeared. The ſubject arrived at his ſeventh year, and it is ſurpriſing that he lived ſo long.

The account of the diſſection communicated by the phyſician D. Waſſenaer to Diemerbroeck himſelf, would have been more ſatisfactory if the natural hiſtory of the boy had been more particularly detailed. We are only told that he was aſthmatic all his life, and haraſſed by violent and frequent cough from the ſlighteſt cauſes; a ſlow fever at length terminated his ſufferings.

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* De Morb. Pectoris. Cap. IV.

The extraordinary conformation of this ſubject was not leſs curious than that of the celebrated blue boy, whoſe caſe is given by Dr. Sandifort, Profeſſor of Anatomy at Leyden.* Here the aorta aroſe from the right ventricle as well as the left; the pulmonary artery was ſcarcely pervious to a ſmall probe, and the difficulty of paſſing it from the heart to the lungs was greater than in the contrary direction. This patient was aſthmatical from the ſecond year of his life, which was extended in a miſerable ſeries of ſufferings to 12 years and a few months.

The circulation through the lungs, impeded by any organic malformation, muſt be productive of Aſthma; and it appears that if the current is diverted from the courſe of pulmonary circulation, the ſame effect, in greater or leſs degree, muſt happen. Haller ſays, that the arterious duct is found pervious in the ſecond year, and the foramen ovale has been open longer by his own obſervation.†

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* Vide Obſervat. Anatomico-Pathologicæ Lugd. Batav. 1777, p. 11. alſo the Remarks of Dr. Beddoes. Obſervat. on Calculus, &c. p. 63, et inſeq.

† Haller, tom. III. 161, 162.

Bartholine* obſerved the foramen ovale open in *adults* more than once.

Morgagni relates the hiſtory of a virgin ſubject who attained her ſixteenth year. She had been ſickly from her birth, and affected with extreme weakneſs; her reſpiration difficult, and her whole ſkin of a livid colour. The foramen ovale was found ſo wide as to admit the little finger.†

In theſe uncommon inſtances of organization, Aſthma may ariſe out of the natural avidity of the habit to ſupply the blood with its oxygen and heat; a proceſs which cannot proceed without inſpiration of air; — but that fluid is diverted from taking the courſe which would expoſe it to its influence.

The heart muſt in theſe circumſtances be too little ſtimulated, and the black blood which it propels from its cavities in a feeble manner, will give anxiety by its delay, and irritate the muſcles of reſpiration to exceſs of action. Their extraordinary contractions being the natural indication of uneaſineſs, not only of the lungs, but of all the thoracic viſcera and inveſting membranes.

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* Anatom. Reformat. Lib. II. Cap. 8.

† Morgagni de Cauſis, &c. Epiſt. XVI.

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Though Baglivi was unacquainted with the chemical decompoſition of air in the lungs, reſpiration loſes none of its importance in his deſcription of the aſſiſtance it affords to the action of the heart. He ſpeaks as ſtrongly of the neceſſity of its aid to that organ, as if he had diſcovered the peculiar quality of oxygen, and the difference of black and red blood. Without the exerciſe of breathing, he ſays, "Nullo "modo parvus muſculus, qualis eſt cor, "centum annorum ſpatio quo quiſque pro- "trahere vitam poteſt, ſanguinis circulationem "velociter et interrupte perpetuaret."*

Miners are ſaid by Sennertus † to have been opened in whoſe lungs metals were found of the kind in which their operations lay. Horſtius confirms the bad effects ſaid to proceed from the metallic fumes to which artiſts are expoſed, but fancifully aſſerts, that ſuch complaints are only to be remedied by mineral medicines. He therefore exhibits mercurials, and their cathartic operation was at all events beneficial; diaphoretic antimony ſucceeded, and the ſweats which were produced had a conſiderable ſhare in taking off the inflammatory condition of the lungs. See Sennertus Pract. Lib. II. p. 2. Cap. 2. — Bartholin. Cent. 4. cū. Theod. Schenkius, Epiſt. 72.

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* Baglivi de Sanguine et Reſpiratione.

† De Conſ. et Diſſenſu, Cap. IX. vide Horſtius, Obſ. L. 7. Obſ. 25.

Stone cutters and cleaners of feathers receive the matter which is ſuſpended in the air into their lungs, and become Aſthmatic. Diemerbroeck, Lib. II. p. 443.

According to Sylvius,* the parenchyma of the lungs is ſometimes denſe and corrugated, occaſioning dyſpnæa. He attributes this ſtate to the reſtringent quality of the blood, but we are under no compulſion to accept his theory. It may be attributed, with great reaſon, to preceding inflammation.

Hoffman deſcribes the veſicles in this diſeaſe, "Quaſi carnea, craſſa, rubicunda, ſub- "ſtantia infarctas."

Morgagni † ſays, the matter filling the lungs is like the ſubſtance of the liver. Senac ‡ confirms this deſcription of the condition of the lungs. But there is ſome diſagreement amongſt authors on the ſpecies of inflammation to which it is owing. After all, Pneumonia is the moſt probable, as deſcribed by Dr. Cullen.

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[*] Sylvius de la Boe. Praxis. Lib. I. Cap. 22. § 17, 18.

[†] De Sedibus, &c. Epiſt. XXI. [‡] Traité du Cœur. L. IV. Ch. 3.

Dr. Baillie adds his teſtimony to the fact alledged by theſe authors. He ſays, "The "ſubſtance of the lungs has in this diſeaſe "nearly the ſame ſolidity, and the ſame gene-"ral appearance as the liver. When ex-"amined more minutely the air cells appear "to be filled with a browniſh ſolid matter."*

Flatus are ſaid to diſtend the lungs, but I cannot comprehend this curioſity. Theſe flatus are ſaid to be carried by the lacteals to the lungs, and to ariſe from the ferment of the ſuccus pancreaticus, &c. For further information the reader may conſult Reg. de Graaf de Succo Pancreatico, Cap. 9. and alſo an author nearer home, Floyer paſſim. A nobleman, ſays Rhodius,† died of a diarrhæa cum ſuſpirio. The lungs were ſo ſwelled with wind as to fill the whole cavity of the breaſt.

Sylvius‡ aſſures us that flatus make their way every where. And Mr. J. Hunter§ coincides in his opinion, as we may preſume from his account of the exploſions from the vagina. Notwithſtanding theſe authorities, it may perhaps be moſt prudent to rely on this fact, that the blood contains no detached maſſes of air.

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* Morbid Anatomy, p. 52. † Obſervat. XXII. Cent. 2.

‡ Lib. II. Cap. 21. § 19.

§ See Animal Œconomy. The phænomenon aſſerted by the ingenious anatomiſt is very plainly deſcribed by Sylvius (loc. citat.) Flatus,—"Obſervantur quoque excludi per Uretham: ſic "qui ad Uterum ſunt delati, aut in ipſo geniti per ipſius cervi-"cem utramque obſervantur erumpere, atque foras exitum in-"venire!"

It may be believed, however, that the lungs are ſuſceptible of a diſeaſed growth, and ſuch inſtances are well aſcertained.*

I opened the thorax of an hydropic patient, and found his lungs of a monſtrous ſize, very pale, and free from any other diſeaſe. The heart was, however, loaded with exceſſive fat; and theſe organs ſeem to have robbed the liver of its nouriſhment, for that viſcus was particularly ſmall. The patient had laboured under dyſpnæa for many years.

The ſuppreſſion of evacuations of blood, as the menſtrual or hæmorrhoidal flux; by which the lungs are neceſſarily oppreſt with the redundant fluid. See Floyer, p. 96.—Hoffman Conſult. and Reſpon. Cent. I.—The difficulty of breathing, from this cauſe, is more entitled to the name of dyſpnæa, and may precede either Aſthma or Phthiſis. Vide Schneiderus de catarrhibus, Lib. III. Cap. 6.

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* Sylvius Praxis, Lib. I. Cap. 24. § 12.

Acrid exanthemata repelled are a cauſe of Aſthma, aſſented to by practitioners; there is no difficulty in ſuppoſing that the matter of thoſe herpetic eruptions, which were manifeſt to the ſenſes when ſeated on the external ſkin, is depoſited on the lungs or their inveſting membranes, when the external diſeaſe ſuddenly diſappears. The ſame obſervation applies to other eruptions, whether attended by pyrexia or not. Phthiſis follows their repulſion as well as Aſthma. See Floyer, p. 100.

An inſtance of relief from the eruption of ſmall tumours which appeared externally, is recorded by Dr. Stark. Clin. et Anatom. Obſerv. p. 44.

Upon the ſame principle, as exanthemata are ſaid to produce Aſthma, the gout atonic or retrocedent may create that affection, and frequently does. In both inſtances the critical and natural depoſition ſhould be made on the ſurface or extremities of the body. See Hoffman de Aſthmate, et Conſult. et Reſp. Med. Cent. 1.

A viſcid mucus ſecreted by the glands of the trachea and bronchia, and loading their follicles, neceſſarily impedes the free admiſſion of air, and irritates the organ. This ſpecies of Aſthma approaches by imperceptible ſhades of diſtinction to the character of periodic convulſive Aſthma, but as depending on a cauſe which is ſufficiently manifeſt to have attained the aſſent of medical obſervers to the force of its impreſſion, it is claſſed with other caſes of the continued or ſymptomatic Aſthma of Floyer, or Dyſpnæa of Cullen. The latter writer called it Dyſpnæa Catarrhalis, and Hoffman Aſthma Pituitoſum, vide Tom. III. Sect. II. Cap. 2. § 3. Alſo Willis Pharm. Rat. p. 2. Sect. I. Cap. 12.

Catarrh is attended with diſordered reſpiration, but is always a febrile diſeaſe, and therefore its termination may be calculated when its attack appears.

Polypi of tenacious matter have been the occaſion of Aſthma when the air veſſels were filled with this ſubſtance. Secretions of this viſcid material induced ſome writers to take the erroneous opinion of vaſcular tubes being diſcharged, but the caſe has been explained with peculiar ſimplicity and diſtinctneſs of comprehenſion by Dr. Warren in the firſt Volume Tranſactions of the College of Phyſicians. Art. XVI. of the Bronchial Polypus.

A more particular account may be obtained of organic derangements of the thoracic and abdominal viſcera, leading to or inducing difficulties of breathing, by conſulting Morgagni and Bonetus.

There are alſo numerous detached facts in the different journals, foreign and domeſtic. Theſe are in every body's hands, and it would be no compliment to the medical enquirer to extend our references to a greater length.*

If, however, curioſity prompts the reader to further examination, he ſhould not neglect the natural hiſtory and diſſection of the celebrated Thomas Parr. For this he may conſult the Tranſactions of the Royal Society for 1668, 1669, and then proceeding to Bonetus he will be gratified by the opinion of that author, that after a man has lived 152 years and 9 months, he may die of a difficulty of breathing and inflamed lungs.†

Theſe cauſes of continued Aſthma have been aſſented to as inducing the diſeaſe, by obſtructing the action of the lungs by the compreſſion of their bronchia or veſicles, by hindering the deſcent of the diaphragm, ſo eſſential to the enlargement of the cavity of the breaſt; or finally, by ſome medium which is not ſatisfactorily explained without conſidering it as an *irritation* to recover or obtain a condition of the organ, unencumbered and free to exerciſe its healthy function.

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* The medical latinity of the writers referred to will ſeldom be admired for the clearneſs of its conſtruction, much leſs is it to be expected that the claſſical purity of a Baker is infuſed in their compoſitions. It may, however, be ſafely aſſerted, that the facts which are to be found in their works are entirely deſerving of conſideration, and that they will lead to views of practice, which without this light, would be neglected or contemned.

† Boneti Sepulchret. Anatom. tom. I. p. 490.

SECT. IV.

Dyspnæa of Dr. Cullen comprizes cases of continued Asthma of Floyer.—Under this name the disease preserves its character in a milder form.—Anhelation an acute case of Dyspnæa, proceeding from violent or rapid exercise.—The muscles of locomotion and respiration do not readily encrease their actions at the same time.

DR. Cullen follows Sir J. Floyer with great attention in the idiopathic ſpecies of Aſthma, but he finds an imprudence in deſerting the ſtrong indications of laborious reſpiration, which point to the cauſe of the diſeaſe in the continued ſpecies of Floyer, or what has been commonly termed the ſymptomatic Aſthma. He therefore excludes moſt of theſe caſes from the genus Aſthma, and places them, with many others, under the genus Dyſpnæa: but a new name will not alter the arrangements of the animal œconomy, nor diſguiſe the phænomena of nature in her diſtreſs.

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* Noſol. Method. G. IV. and L. VI.

In dyſpnæa, the ſpecies ſtill depend on ſome cauſe which irritates the organ by its obſtruction or acrimony, and excites the complaint. Under that head in the noſology the cauſe frequently is made to diſtinguiſh the varieties by a trivial addition, and it is ſtrictly unreaſonable to attribute degrees of the ſame affection to diſtinct eſſential origins.

Whenever there is a difficulty of breathing there is an exceſs of reſpiratory actions, which always is occaſioned by irritation, but the proportion of that exceſs will be commenſurate with the force which excites it, and the ratio of the irritation will be compounded of quantity and quality, in degrees not always to be aſcertained;* ſtill we muſt not forget that "Majus aut minus non variat ſpeciem."

Dyſpnæa is conſidered by Hoffman as tranſitory, and without danger.† It attends commonly on the corpulent, fat and plethoric, who ſuſtain this affection moſt when the body is put in motion. It may be called a ſlighter Aſthma, in which the convulſive motions of the reſpiratory muſcles do not appear, but there is an effort of painful reſpiration, which comes on, not with regular periods, but according to the occurrence of exciting cauſes. It is a ſtate which diſcovers very generally the prediſpoſition of the body to the more violent affection which it often precedes. Too great fullneſs of the pulmonary veſſels is the moſt frequent cauſe, becauſe then the blood paſſes with ſome delay to the left ſide of the heart, and this happening in a habit, which, from the cauſes to be explained hereafter, is relaxed in its vaſcular ſtructure, the contractile tone of the artery is weak, and unable to withſtand the diſtending force. Dyſpnæa in this view is excited by compreſſion of the veſiculæ and bronchia by the pulmonary veſſels, which do not allow a perfect dilatation from inſpired air, and diſtreſs the organ.

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* The cauſe is here ſuppoſed to be applied to a habit in which the ſtandard of nervous ſenſibility is moderate and common to ſubjects not advanced far in the diſeaſe. Accumulated irritability produces, or is attended by, increaſed ſenſibility to ſtimuli; and habits of morbid contractions of muſcles are a diſorder when the primary irritation is removed.

† Opera, tom. 3. Sect. II. Cap. 2. § 3. Willis Pharm. Rat. Part II. Sect. I. Cap. 2.

If in this previous condition of the lungs the circulation is accelerated by an accidental cauſe, the accumulation in the pulmonary veſſels is intolerable, and it is becauſe theſe veſſels are of a ſtructure not thin and tender, but dilatable, that rupture is not the conſequence. But though the conſtitutional prediſpoſition enables them to eſcape hæmorrhagy of red blood, theſe veſſels muſt be relieved, and under violent diſtreſs, connecting this affection with Aſthma, they effuſe their ſerous contents into the veſiculæ of the lungs, and their general diſtention becomes leſs.

It is therefore obvious how Dyſpnæa may reſult from inconvenience to the pulmonary function, and how it may in its progreſſive cauſes aſſume the character of Aſthma.

It has already been ſtated that ſuppreſſions of cuſtomary evacuations of blood, materially lead to this condition of the veſſels of the lungs creating Dyſpnæa.

That ſuffocative ſenſation which is brought on by rapid exerciſe is a more acute caſe of Dyſpnæa. Its immediate cauſe is ſimilar, though the remote ones had not influenced the habit. Noſologiſts, ever fond of refinement and ſeperating effects from their parent cauſe, have called it Anhelation, a term which very well marks the appearance of the affection.

When a perſon is ſaid to be "*out of breath*" from violent exertion of this kind, the blood has been accelerated from all parts of the body to the heart, that organ is ſtimulated to diſcharge it through the lungs to the left ſide, and its contractions are quick in proportion to the frequency with which this ſtimulus is renewed. Under this rapid circulation inſpirations of air are ardently deſired by the pulmonary ſyſtem, but the exertions of the locomotive muſcles ſeem to check the efforts of thoſe ſubſervient to inſpiration; and to prevent the reſpirations being encreaſed in the cuſtomary proportion to the pulſation of the heart and arteries. If *18 reſpirations uſually accompanied 70 pulſations of the heart, 140 pulſations ſhould be attended by 36 reſpirations, but it is certain that this balance is loſt in violent exerciſe.

When the action of the locomotive muſcles is ſuſpended, that of reſpiration continues and is even encreaſed, fuller and deeper inſpirations are obtained and the blood being more readily paſſed through the lungs, becauſe the organ is more perfectly expanded, relief of the diſtreſs for breath takes place, or rather a ſenſe of ſuffocative irritation is removed. During the violence of motion the expirations diſcharge more air than is reſtored by inſpirations, the muſcles acting in inſpiration being liable to relax, whilſt a

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* This number ſeems to be too great, though taken for calculation. Haller makes 8 pulſations to correſpond with one reſpiration of a healthy man, a proportion too ſmall. Vide Haller ad prælect. Boerhaave. DCXXV.

different ſet of muſcles are in an uncommon ſeries of contractions, but the great impetus of the heart prevents that collapſe of the pulmonary veſſels which is produced in natural expiration, ſo that in this temporary artificial Aſthma, there is no interval to be calculated between the reception of the pulmonary blood in the left ventricle, and its diſcharge from the right. The effect of ſuch a ſtate muſt be a continual fullneſs of the pulmonary veſſels, a natural niſus to expand the air cavities, that the oppreſſion may be removed from the organ, —but an inability to give relief till the other muſcles of the body are at reſt, when the heart will not be ſo inceſſantly ſtimulated by the arrival of venous blood, and nature can put in exerciſe the muſcles of reſpiration.

This Anhelation may be juſtly ſaid to be excited to relieve the organ of the blood which unuſually diſtends the veſſels, and is truly an irritation of the lungs. Haller* points it out as the efficient cauſe of the whole proceſs of reſpiration in a moderated and natural degree, but if a ſenſe of ſuffocation originally excited the exerciſe of breathing, and if the function continues to be ſupported by the living animal through the habitual, and therefore imperceptible operation of the ſame cauſe, the extreme caſe of too violent and morbid repletion of the veſſels may be well ſuppoſed to excite a proportionate action of the reſpiratory muſcles for the ſame end.

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* Elem. Phys.

This diſtreſs from violent exerciſe is however moſt oppreſſive to thoſe who have not been in the uſe of it, for habit will not only enable a perſon to act with his locomotive muſcles in conſiderable increaſe of vigour, but to accompany their exertion with more reſpiratory action than in others who have not purſued it. In theſe alſo the veſſels will not be ſo ſubject to partial dilatation, and the fluids contained will be more equally diſpoſed of through the ſuperficial capillaries of the body; but where is the inſtance to be found of education or habit having entirely overcome the influence and conſequence of ſome irritation from this cauſe?

Mr. Hunter* has an obſervation, which appears to attribute the being out of breath in exerciſe, to the deficiency of air taken in, in proportion to the accelerated motion of the blood, and he thinks that in exerciſe we probably breath leſs air: true! but there is no apparent deficiency of oxygen, for the blood of a perſon who has been ſo moved, being drawn is as florid, and probably more ſo, that after a ſtate of reſt; in fact, though the inſpirations are not in proportion to the pulſes of the arteries on this occaſion, yet the maſs of blood paſſing more frequently through the lungs, cannot want the opportunity of imbibing oxygen, which may not ſo completely enter into new combinations in the capillary veſſels, during this artificial ſtate of circulation. To ſay that a perſon breaths quick or laboriouſly becauſe he is out of breath, or wants breath, is ſurely giving little ſatisfaction to the phyſiological inquirer.

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* Vide the Animal Œconomy, p. 97.

The want of air in the lungs is therefore the natural propenſity to imbibe it in proportion to the quantity of blood which has uſually paſſed through the lungs in a given time, and becauſe the veſſels are morbidly ſtimulated by their unuſual contents, this propenſity aſſumes the activity which attends irritation. The veſſels are then too turgid, and therefore compreſs the air veſicles, but independent of this condition, the inability of ſupplying the organ with its requiſite meaſure during the act of violent exerciſe of the locomotive muſcles, ſtands upon the ſimple baſis of a natural law, that certain ſyſtems of muſcles are not readily brought into action when other ſyſtems are employed, though habit and repetition will diminiſh the difficulty. Therefore the muſcles which ſerve inſpiration, are not without practice induced to take extraordinary action, when the muſcles of locomotion are vigorouſly contracted.

M. Girtanner* adduces the contractions of the heart in ſupport of his doctrine of the laws of irritability. "The heart contracts "from the ſtimulus of the blood, and impels "the blood through the arteries; it then again "dilates and the blood enters. But the heart "does not contract itſelf immediately upon "the firſt impreſſion of the blood. Its irrita- "bility having been leſſened by the preceding "contraction, it requires half or three quarters "of a ſecond before the irritability of the heart "ſhall have accumulated to ſuch a degree "that the new ſtimulus can act upon it."— He then ſays it is impoſſible to explain the motion upon any other principle, and that Haller's irritability of the heart is inſufficient to account for its ſyſtole and diaſtole. For, ſays this critic in phyſiology, aſſuming the objections of the opponents of Haller, "If "the blood acts upon the heart as a ſtimulus, "and its contraction is the conſequence of

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* See Girtanner's two Memoirs in Dr. Beddoes Obſ. &c.

" ſuch action, how comes it that the heart " does not contract as ſoon as the blood enters " it, but that it flows in ſome time before the " contraction is renewed? why does not the " effect immediately follow the cauſe? Haller, " he ſays, could never anſwer this objection, " becauſe he was a ſtranger to the laws of irri- " tability." But is not this objection anſwered by the tenor of Haller's doctrines, and by the accepted truth of phyſiology? the blood ſtimulates the irritability of the heart by its compound force of quantity and quality. When it begins to flow into the right ventricle there is a progreſſive accumulation of ſtimulus, but it muſt arrive at its acmé before the contraction is excited by its power. Diſtention of a hollow muſcle is a ſtimulus to its irritability, but can the heart be expected to be influenced by it before the ſtimulus has obtained a certain degree in its progreſs. Whatever then may be ſaid of the quality of the blood, this diſtention being a part of the compound force, the heart will not be impreſſed to contract itſelf from the influx of a minute quantity, but if the return of the blood is violently accelerated and the compound ſtimulus is rapidly renewed, the contractions of the heart correſpond with the impreſſion made upon it, and half or three quarters of a ſecond are not neceſſarily the intervals of its reſt.

If Haller was a ſtranger to the laws of irritability as given in the memoirs of Girtanner, he was well acquainted with the force of impreſſions on animated matter.

The author of this inquiry heard the elucidation of theſe laws, delivered in the year 1780. But the Elementa Medicinæ, of Dr. John Brown are a ſubſtantial record of the title which that philoſopher had to the principles delivered in theſe memoirs as new.—Science ſhould frown upon the attempt which the writer has diſplayed without delicacy and feeling, by which poſthumous celebrity, too often the only gift which genius can hold in view to incite its efforts, and invigorate its powers, is to be raviſhed from its juſt poſſeſſor. The acrimony of medical ſchiſm expired when Brown retired from perſecution and the world. The opponents of his ſyſtem, may now acknowledge the advantage of purſuing ſome of his hints, and of adopting many of his concluſions. To their juſtice the appeal may be made from the claims of Girtanner, and let their foſtering attention to the reputation of the dead, continue to animate the philoſophical ambition of living merit.

Practical Inquiry

ON

DISORDERED RESPIRATION.

PART II.

PART II.

CONVULSIVE ASTHMA.

SECT. V.

The progreſs made in this inquiry.—Aſthma from irritation *not ſo apparent as in the continued ſpecies.—The* PERIODIC FLATULENT *of Floyer; the* SPASMODIC ASTHMA *of Cullen.—The diſeaſe deſcribed.—Its proximate cauſe inveſtigated.—The path which was followed in the inquiry after the cauſe of the manifeſt ſpecies purſued in treating of this.—Symptoms and indications generally the ſame.—Sir John Floyer's caſe.*

I Hope that ſome ground is now gained in the inquiry after the immediate cauſe of that affection of the reſpiratory muſcles, which in a ſlight degree has been termed Dyſpnœa, and in a more ſevere degree Aſthma. It has appeared from the analogy of violent contractions in other organs, that the irritation of extraneous matter in the lungs may be conſiſtently believed to excite ſimilar contractions of theſe muſcles. The affection of reſpiration has even been traced both in Dyſpnœa and Aſthma to a material, which could not fail, by its offending properties, to irritate the pulmonary organ, and diſturb its functions. In many inſtances of ſucceſsful effort to eject the oppreſſive ſubſtance, the energy of reſpiratory labour has ceaſed, nor would it ever continue after the exciting cauſe is removed, but from collateral inconveniences which it may have induced by the violence and repetition of primary irritation, and which are referable ſometimes to the laws of muſcular aſſociation and habit, at others to the alteration of organic ſtructure, which may occaſion new cauſe of diſturbance.

But there is a diſtinction taken by *Sir John Floyer in which he ſeparates the affection which is occaſioned by a manifeſt inherent cauſe, from that in which the cauſe is not ſo obvious to his ſenſes. The latter he calls "the Periodic flatulent Aſthma." †Willis terms it "Aſthma Convulſivum." ‡Hoff-

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* Floyer, Chap. 1. † Willis Pharm. Rat. P. II. Sect. I. Cap. 12.

‡ Hoffman, III. 94.

man and *Cullen, Convulſivum et Spaſmodico-flatulentum, or, Spaſmodic Aſthma.

The laſt author makes three idiopathic ſpecies under this genus, of which the firſt ſeems to be neareſt to his interpretation of the generic diſorder, though he does not propoſe it as a ſpecimen in preference to the others.—This ſpecies is ſpontaneous, "ſine cauſa manifeſta vel alio morbo comitante." The ſecond is *Aſthma Exanthematicum*, which proceeding expreſſly from the retroceſſion of an exanthematous acrimony, may juſtly and without delay, be attributed to material irritation, with other caſes which have been remarked under the Dyſpnœa of Cullen, and the Continued Species of Aſthma of Floyer.—The Aſthma Plethoricum ariſes from a ſuppreſſion of uſual evacuations of blood, or from a ſpontaneous plethora. It is true that ſuch a ſtate of the pulmonary veſſels may exiſt, as, by compreſſing the veſiculæ and bronchia, may impede their perfect expanſion, but I have taken the liberty of calling the affection derived from that cauſe dyſpnœa, or a ſlight Aſthma, becauſe, unleſs it has proceeded to the degree which produces effuſion of ſerum from the exhalents, it does not periodically excite the convulſive and laborious reſpiration of a paroxyſm.

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* Noſolog. Method. G. LV. Practice of Phyſic, MCCCLXXIII.

It is the diſeaſe which comprehends the above idiopathic ſpecies, which Cullen thinks is alone properly called Aſthma, "as it depends upon a peculiar proximate cauſe, and "has peculiar ſymptoms." This is the periodic flatulent, or ſpaſmodic Aſthma, which is to be treated of in a more particular manner.

The attack of a paroxyſm of periodic or convulſive Aſthma is preceded very generally by Dyſpepſia, and the circumſtances which occur to a relaxed habit. This condition of the body may have prevailed for months or years before it aſſumes the additional form of Aſthma, but when that diſeaſe is commenced, the ſymptoms of Dyſpepſia never fail to become aggravated, and to ſhew themſelves with violence before the fit. Theſe ſymptoms are flatulence and diſtention of the ſtomach and bowels; a heavy pain over the forehead and eyes; eructation of wind, with water which is ſometimes inſipid, at others ſour.—When the evening approaches this weight over the eyes becomes more oppreſſive, and the patient is very ſleepy. Occaſionally, if particularly animated by company and converſation, the drowſineſs does not take place, but a ſhortneſs of breath is perceived, and ſoon after much anxiety of the præcordia, with great reſtleſſneſs. The preſence of company then becomes irkſome, as it ſeems to increaſe a certain heat of the body, a want of free reſpiration, and an irritability which repels the moſt cautious attentions of friends. Frequently at this period there is a tingling and heat in the ears, neck, and breaſt, and a motion to expel the contents of the bowels is attempted with ſome violence, and with great uneaſineſs of the abdominal muſcles. When an aſthmatic feels theſe warnings he may be convinced that his enemy is at hand.

At ſome uncertain hour before midnight the patient is ſenſible of the violence of the diſorder; moſt frequently after a ſlumber in bed he awakes with great difficulty of breathing, and feels the neceſſity of a more erect poſture of his body. Inſpiration is performed with great effort of the muſcles ſubſervient to that function, but is never perfectly deep, and the diaphragm ſeems to deſcend with great difficulty againſt an oppoſing force.

There is now a deſire of free air, ſpeaking becomes diſtreſſing, and the irritability of the mind continues, but is not ſo acute as in the approach of the fit. There is great ſtraitneſs of the cheſt, and a wheezing ſound in reſpiration. An inclination to cough ſhews itſelf, but it is ſmall and interrupted. The pulſe is increaſed in quickneſs a few ſtrokes, but there is no hardneſs in the pulſation. No preternatural thirſt, unleſs, as often happens, the fit is excited by the preſence of indigeſtible matter in the firſt paſſages. There is a propenſity to make water, which is diſcharged copious, frequent and pale.

After ſome hours of diſtreſs the patient perceives his anxiety to be leſs, the breathing leſs quick and laborious, the inſpirations longer and more full, the expirations ſtill attended with wheezing; the pulſe not ſo quick and more open, irritation leſs acute. The cough probably brings up a portion of phlegm, and a very ſenſible relief follows that excretion. Then the tranquil ſtate of the feelings introduces ſleep, but not unaccompanied by wheezing, which continues almoſt always through the firſt night, and until, by the progreſs of the fit on the ſecond or third day, a more conſiderable expectoration of mucus takes place.

The ſecond day is uſhered in by a remiſſion of the ſymptoms which the patient perceives from the time of awaking in the morning. No change of poſture, is however, yet performed with impunity, and particular diſtreſs will affect him, if he engages in the fatigue of dreſſing whilſt the ſtomach is empty. The pulſe will be accelerated more than it was in the acmé of the paroxyſm, and motion muſt frequently be ſuſpended, or a vehement agony for breath will certainly ſupervene.— During the day if no particular hurry occurs, the breathing becomes gradually more free till the evening, an inexperienced Aſthmatic even flatters himſelf that his diſeaſe is retiring, but he finds at the approach of night that he muſt ſuſtain a new attack. The paroxyſm recommences with the uſual ſymptoms, and the night is paſſed nearly as the former, but the ſleep is more perfect and productive of more relief.

The third day, the remiſſion is more complete, there is ſome additional expectoration, and motion is exerciſed with leſs diſtreſs, but ſtill with great inconvenience. After the paroxyſm has renewed its invaſion in this manner for three nights, expectoration generally becomes free, but there is no certain termination of the fit at a fixed period. However, except in particular caſes, it goes off after a few days. And as the daily remiſſions become more perfect, the urine becomes higher coloured, and in ſmaller quantities; the expectorated mucus is more copious and digeſted.

ſtrength of pulſe and vigour of action encreaſes, and good humour and ſunſhine again enliven the mind.—The expectorated mucus has been ſaid to be ſtreaked with black, or to have a blackiſh tinge, and this appearance certainly prevails in many inſtances, but not invariably. The taſte of the expectorated mucus is alſo equally uncertain, ſometimes ſweetiſh, but moſt frequently ſaline, and occaſionally coloured minutely with blood.

There is conſiderable variation in the time of acceſſion of the paroxyſm, and the length of its duration, the intervals between the fits, the quantity of mucus expectorated and the freedom of that diſcharge. Theſe circumſtances of the diſeaſe will be influenced by the prediſpoſing cauſes and concurrent accidents. The diſeaſe appears to invade all temperaments, but, I believe more particularly the melancholic, or that which is intermediate between the melancholic and ſanguine. The ſanguine being in fact more liable to fall into phthiſis.

In the progreſs of this inquiry other circumſtances belonging to the paroxyſm by caſual attachment, will be occaſionally deſcribed.

In examining the ſymptoms of the paroxyſm of this diſeaſe, we find ſome uniform and conſtant, and others generally occuring, but with uncertainty in proportion to the various fluctuating and accidental influence of prediſpoſing and exciting cauſes.

The ſymptoms which are ſufficiently conſtant to diſtinguiſh it are deſcribed by Dr. Cullen in his Noſology.

" A difficulty of breathing coming on at
" intervals.

" A ſenſe of ſtraitneſs in the cheſt.

" A wheezing in reſpiration.

" Cough in the beginning of the fit, diffi-
" cult or none; towards the end free, and
" attended with expectoration which is often
" copious."*

In endeavouring to find the cauſe of theſe ſymptoms, I ſhall attend to the ſteps which have already led me to the ſource of ſimilar appearances in diſorders of reſpiration before treated, and I ſhall aſſume the probability of finding a cauſe ſimilar in its properties of acrimony or bulk, by which the energy of the reſpiratory muſcles is irritated into exceſs of action.

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* Aſthma. Spirandi difficultas per intervalla ſubiens; cum anguſtiæ in pectore ſenſu, et reſpiratione cum ſibilo ſtrepente; tuſſis ſub initio paroxyſmi difficilis, vel nulla, verſus finem libera, cum ſputo muci ſæpe copioſo.

Noſolog. Method. G. LV.

In thoſe diſorders a material was excreted, or a compreſſing force was removed, before the extraordinary contractions of the muſcles was ſuſpended, or finally made to ſubſide. In ſome caſes a mechanical inconvenience, as in the inſtance of a gibbous ſpine, could not be expelled, and then the proportion of irritation which it was calculated to give, continued in action, and the diſorder of reſpiration did not ceaſe.

In ſuch circumſtances the indications were natural, and entirely coinciding with the laws which govern the animal œconomy. They would have afforded prima facie evidence of ſomething which nature was deſirous to diſcharge, even if the offenſive ſubſtance had not been expoſed to the obſervation of the ſenſes.

Having aſcertained ſuch outlines and ſignals of direction, we are impelled to follow the path in which nature is our guide; and we are encouraged by the acknowledged ſimplicity and uniformity of her laws, to expect that the ſame principle of *irritation* has excited her efforts in one caſe of Aſthma, as in another, though it may be more retired from our view, and wear a different form.

Inductive reaſoning, ſays Dr. Crawford,* is defended by the confidence and reliance of mankind, and univerſal experience aſſents to its evidence when applied to the phænomena of nature, depending on general and ſimple laws.

But notwithſtanding the ſecurity which attends this road to the diſcovery of truth, the remark of Dr. Ferriar,† is unfortunately too capable of defence by the general practice of medical inveſtigation. We have not yet ſufficiently attended to the injunctions of Bacon, and it may be added, we are not enough chaſtiſed by his rebuke to follow his method.

If this complaint is not well founded, why have authors reſorted to conjectural theories in preference to apparent indications of ſenſible appearance in explaining the cauſe of Convulſive Periodic Aſthma?

In this ſpecies of Aſthma it appears, by the diagnoſtic ſymptoms of noſologiſts, that the ſame efforts of the muſcles of reſpiration are exerted as in the Continued Species of Floyer, in which the paroxyſm does not ſubſide into a perfect intermiſſion, and that in general a continuance of too much action of thoſe muſcles is the only diſtinction to be perceived in the latter ſpecies, as far as regards external phænomena.

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* Exper. and Obſervat. on Animal Heat. p. 65.

† Med. Hiſt. and Reflect. Introduction.

It appears, therefore, more diveſted of hypotheſis, to have inferred that ſimilar effects have proceeded from the operation of ſimilar cauſes, and to have combated the diſtinction ariſing from the permanence of the ſymptoms in one ſpecies, and their ſuſpenſion in the other, by adverting to the powers of the animal ſyſtem, and examining if thoſe powers furniſhed a means of ſilently, but efficaciouſly removing the particular irritation which the data might have ſuggeſted to be the occaſion of the Periodic Aſthma.

Is there any excluſive myſtery in the formation and motions of animal matter but what reſults from the vital principle? And when it is animated by this principle, does the compound ceaſe to be directed by its author and creator through the medium of the wiſeſt laws, the ſyſtem of which is "*Nature?*" A code of rules to which all creation is ſubjugated by the CAUSE OF CAUSES.

Phyſicians have not the power to purſue the inveſtigation of a cauſe producing certain appearances in the animal machine, without tracing thoſe appearances with conſtant reference to the laws of the œconomy of life, any more than the general philoſopher can take a latitude independent of immutable principles in reaſoning on the natural objects of his inquiries. " By the rules of philoſophizing," ſays Dr. Crauford,* " we are to admit no more cauſes of natural things than ſuch " as are both true and ſufficient to explain the " appearances." Nature does nothing in vain, and having exhibited to us any one cauſe of an operation, we are not fruitleſſly to ſpeculate on complex cauſes of that effect. This admonition is enforced by Sir I. Newton, when he ſays, " Fruſtra fit per pl~~e~~ura quod fieri poteſt " per pauciora."†

Sir J. Floyer deſcribes the *Periodic Aſthma* in a manner which leaves no doubt of all the powers ſubſervient to reſpiration having been employed with exceſs of energy in that, as well as the *continued ſpecies*. " The diaphragm " is not without much difficulty moved downwards; but for enlarging the breaſt in inſpiration, the intercoſtal muſcles, which " ſerve for the raiſing of the ribs, and lifting " up the breaſt, ſtrive and labour more vehemently; and the ſcapular and lumber muſ-

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* Exper. and Obſerv. on Animal Heat. p. 366.

† Vide Newtoni Principia, Lib. III. p. 202 et 357.

" cles, which ſerve for ſtrong inſpiration, join
" all their force, and ſtrain themſelves to lift
" up the breaſt and ſhoulders for enlarging
" the cavity of the breaſt, that the lungs may
" have a place ſufficient for their expanſion,
" and the air more plentifully inſpire."*

Here is ſufficient evidence of diſtreſs in labouring to accompliſh ſome object, but Floyer, who had perſonal experience of the diſeaſe for thirty years, had not begun to conſider the effort as the energy of nature in endeavouring to remove a material offending the pulmonary organ.—This can only be accounted for by ſuppoſing that he was influenced by a preponderant theory, and that obſerving in ſome very few inſtances of the diſorder no excretion of mucus or other extraneous matter, he was diſcouraged from following to their ſource ſymptoms which attended in conſiſtent uniformity the progreſs of general caſes: and we ſhall be ſtill leſs ſurpriſed at his deficient deduction from facts, when we reflect upon the ſmall advances which had been made in the knowledge of the abſorbent lymphatic ſyſtem, the active power of which is exerted with ſuch important effect in the removal of ſerous effuſion in every cavity of the body. But ſince the time of Floyer phyſiologiſts have referred, with more preciſion, the occaſional increaſe of powers to the urgency of any obſtacle to the freedom of pulmonary action. In thoſe caſes, ſays Haller, the muſcles inſerted into the thorax, clavicles and ſcapulæ, unite their force. "Scaleni muſculi, maſtoidei, trapezii, pecto-"rales, tum levatores parvi, quos ex anatome "oportet repetere."*

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* Floyer on the Aſthma, p. 7.

That a proportionate addition of energy incites the abſorbent veſſels into action when the lungs are threatened with ſuffocation, appears from the obſervation of Mr. Cruikſhank.† "I have repeatedly ſeen in animals "dying of hæmoptoe, and in the human "ſubject itſelf, the lymphatics of the lungs, "which at other times contain a tranſparent "fluid, turgid with blood, which they had "abſorbed from the air cells."

Motions performed with great energy are therefore ſtrong indications of ſome injury to be averted, or ſome offence to be removed. And as in the Periodic Aſthma, the cauſe is not ſo indiſputably conſpicuous as in the Continued Species, I ſhall take advantage of theſe indications, and apply them as the beſt direction which an obſcure diſeaſe affords.

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* Pr. Lin. Phyſiolog. CCLXIV.

† On the abſorbent veſſels, p. 42.

They point to an *irritation* in the pulmonary organ, and from the preceding ſections I am led to ſuppoſe that this irritation may be *material*. I therefore conſider if any excretion of matter favours the ſuppoſition, or if any appearance of offence conſtantly accompanies the progreſs of the diſeaſe, and vaniſhes when the diſeaſe diſappears; or, being occaſionally abſent, if its abſence can be accounted for by certain known and accepted laws of the animal œconomy.

SECT. VI.

The preſence of mucus in Aſthma.—The origin of this ſerous fluid.—The obſervation of writers on this ſymptom of the diſeaſe.—The earlieſt medical Authorities.—Hippocrates—Galen—Alexander Trallianus.—The Arabian Phyſicians.—Remark of Willis and criticiſm of Morgagni on the opinions of the antient Authors.—Medical writers of the 16th and 17th centuries.—Jodocus Lommius—Sennertus—Riverius—all acknowledged the exceſs of Serum in Aſthma, and made it a cauſe of the diſeaſe.—The doctrine of Willis founded on this condition of the fluids.—Conſiderations on the authority of Willis.

"SÆPE ſæpius miratus ſum," ſays Willis, "quid fiat de effluviis vaporoſis, quæ perpetim e ſanguine in præcordiis efflagrante copioſiſſime et nonnunquam impetuoſiſſime dimanant."

The excretion of mucus is a ſymptom of ſo often attending the convulſive Aſthma, that it could ſcarcely have eſcaped the particular obſervation of modern phyſicians, and the ſecretion of it have been conſidered as the principal cauſe of the diſeaſe, but from the obſtacle of ſome few caſes having occurred, in which no expectoration appeared, and of ſome others where it was not conſidered equal to the effect produced.

Theſe inſtances of Aſthma have however been very uncommon, and may be ſhewn to have depended on the ſame proximate cauſe embodied in a more ſubtle form, or the abſence of the excretion of mucus may admit of ſatisfactory explanation in the laws of the animal œconomy: at the ſame time the general preſence of accumulated fluid in the lungs is a part of the diſeaſe, conſpicuous whilſt its ſymptoms remain, the matter is excreted from the bronchia as the paroxyſm declines, and is expelled freely and copiouſly in moſt caſes at the termination.

This matter is ſeparated upon the membranes of all the cavities of the body.* Where thoſe cavities have external openings it is not coagulable by heat, but where there are no external openings it is coagulable in the heat of boiling water.

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* Ορρὸς ſerum and lymph are not proved to be different from mucus, and diſtinctions can only be taken according to the conſiſtence of the fluid. They are equally the watery part of the blood, ſeparated in a condition more or leſs morbid.

Its quantity in general will be found to be regulated by the vigour of the animal, becauſe the power of abſorption bears a relative proportion to his ſtrength or weakneſs.

An acute phyſiologiſt makes the following diſtinction: "In diſeaſes where the con-
" traction of the veſſels is too great, there is
" ſcarcely as much moiſture in the cavities
" or interſtices of the parts as allow them to
" ſlide eaſily one upon another. In health
" the quantity of ſuch liquors is moderate,
" and a pretty conſtant equality is kept up
" between the action of the exhalents and
" abſorbents: but when the body turns weak
" the exhalents pour out ſo much more than
" the abſorbents can take in, that all the
" cavities are found to contain conſiderable
" quantities of liquors."*

The preſence of ſuch liquors in the lungs, and the natural proceſs by which their morbid accumulation was to be prevented, was conceived, though not fully explained by the ſagacious Willis, who ſays, "loculi,
" ſeu ſpatia iſta inania ubique ex omni parte
" diſponuntur, quæ vapores in pulmone oc-
" cluſos excipiant, et eoſdem mox condenſatos
" per lymphæ ductus, quaſi per totidem
" alembici roſtra extillent."

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* Alex. Monro, Sen. Works, p. 377.

But ſuch effuſion of lymph on the membranes, and in all the cavities of the body, is allowed to be neceſſary to health, in a moderate proportion, and occaſionally to be encreaſed to a morbid accumulation when diſeaſe has lowered the tone of the animal ſyſtem. In the application of its influence to the production of Aſthma, the authority of former writers may naturally be conſulted. In examining ſuch authority, we muſt however be careful to limit the extent of evidence to the hiſtorical detail of ſenſible appearances, excluding a partial bias to the attraction of prevailing theories, or averſion from thoſe which are exploded. The former may not conſiſt with the evidence of natural facts, and the latter ought not to involve in the fate of their diſgrace the record of phænomena, which experience has rather ſtrengthened than oppoſed.

Without minutely ſearching the writers of all ages to aſcertain their ſentiments on Aſthma, a taſk little profitable, and ſtill more unentertaining, I ſhall ſlightly exhibit a ſpecimen of the teſtimonies of thoſe who had weight at the different periods in which they flouriſhed.

From theſe examples we may fairly infer what would be produced by a more extended inveſtigation; in fact, the cotemporary writers, and thoſe who followed the authors whom I here adduce, coincide with great fidelity in the doctrines of their brethren, and as far as I have been able to purſue the inquiry, no variety of deſcription ſufficient to invalidate the above remark is to be diſcovered.

The cerebrum was ſuppoſed by Hippocrates, and the earlieſt phyſicians, to be the grand receptacle of pituitous humour. Here were the vapours ariſing from the ſtomach, liver, and lower viſcera ſublimed, and then by the coldneſs of the brain, condenſed into the fluid which conſtituted pituitous matter: theſe, phyſicians called the head, the author, and chief reſidence of all defluxions.

From whence could this theory take its origin but in obſervation which witneſſed in many diſeaſes of debility and exceſs of ſerous humour? In catarrh the firſt diſcharge was from Schneider's membrane: and in many more important complaints the firſt ſymptoms were attached to the head: the ſevereſt diſorders of the body, when theſe were marked by accumulated ſecretion of lymph, became connected with the prevailing opinion of the functions of the brain ; but this opinion could only apply where exceſs of ſerum was an evident ſymptom in the diſeaſe.

Galen makes two cauſes only of Aſthma, each diſtinguiſhed by a material involving irritation, thick and pituitous humours, and a crude tubercle in the lungs

Alexander Trallianus does not expreſsly mention Aſthma by name, but doubtleſs alludes to that affection of diſordered reſpiration when he treats of the "ſigns of viſcid "humours contained in the lungs;" which, he ſays, muſt clearly flow there from the head, or ſome other part. He proceeds to relate a caſe which he conſiders as very wonderful and uncommon, and connected with the ſymptoms which diſtinguiſh that diſorder of the lungs, proceeding from the irritation of viſcid humours; the ejection of a real ſtone by expectoration. He adverts alſo to ſimilar hiſtories by Galen, in which ſtones, or concretions like hail, are recorded to be ſpit up. Inſtances of this kind have been ſufficiently referred to in the firſt part of the Inquiry. Viſcid ſerum, and ſuch extraneous ſubſtances, were the only recorded cauſes of Aſthma at this period of medical obſervation: nor is any alteration to be expected during the interval of many centuries.

At length the Arabian adopted the pathology of the Greek phyſicians, with ſome addition, but little or no rejection of their facts: in Aſthma their doctrine was accepted without diſpute; and the remedies directed were to incide, dry up, expectorate, divert, and purge off ſerous humour in the lungs. Avicenna gives the caution of not uſing the moſt powerful diuretics, leſt the thinner fluid ſhould be diſcharged, and the thick remain behind.

This practical direction reſulted from the deference which the Arabian phyſician paid to the doctrines which he received from Greece. Pituita was ſuppoſed to take a conſiſtence according to the ſituation in which it was included after it had deſcended from the head. At firſt it was watery and thin; then mucous as it was thickened by warmth; when the mucous diſtillation was ſhut up in a cold part of the body, it aſſumed tenacity, and became vitreous; and in this ſtate would create exceſſive pain if transferred to a hot ſituation: it was laſtly gypſeous, or ſtony, when included in the lungs, kidneys, or joints; becauſe here the humour being reſolved, and the thinner parts carried off, the thickeſt hardened into calculous ſubſtance.

When theſe obſtructions were the only cauſes clearly aſſigned by the ancient writers for the production of Aſthma, Willis might juſtly remark, that they were not aware of a purely convulſive affection in contemplating the general character of that diſeaſe. Morgagni,* by his criticiſm, has not invalidated the aſſertion of Willis; for though the nerves may be ſometimes particularly affected in the opinion of thoſe authors, the impreſſion which they receive is from defluxion of ſerum, pituitous matter, or its ſuppoſed origin, the vapours from the lower viſcera. It is a very ſtrong proof of the infrequency of Aſthma, without manifeſt irritation from ſuch cauſes, when the ſubject of more obſcure cauſes is matter of debate.

The Arabian writers were themſelves copied with ſervile dependence till the ſixteenth, and even the ſeventeenth century, when the diffuſion of anatomical knowledge, and a zeal for experiment, may be ſuppoſed to have excited more clear diſcernment of cauſes and effects, and more juſt reaſoning on their relation. We ſhall therefore ſelect ſome examples of the doctrines on Aſthma at thoſe periods; but ſhall liſten with moſt attention to Willis, who has given ſo remarkable a tone to the teachers who followed him in treating of this diſeaſe, that his authority may be traced through the opinions of Hoffman, Floyer, and Cullen; though it will appear that theſe celebrated men had a very imperfect, if not erroneous comprehenſion of his principles and meaning.

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* Liber II. Epiſt. XV.

Jodocus Lommius* gives the ſigns of this diſeaſe under the term Anhelatio. He attributes it to concreted phlegm, and even ſtones in the lungs; and informs us, that thoſe ſuffer moſt who are moſt troubled with defluxions and coughs; and if during the prevalence of the ſymptoms a new defluxion comes on, the patient is commonly deſtroyed. In ſpeaking of a crude tubercle, he ſays, that the ſigns are like thoſe in Aſthma, excepting that no preceding defluxion is remarked, and reſpiration is performed without wheezing.

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* Obſervat. Medicinal. Liber Secundus. P. 110, necnon p. 125 & ſeq.

Sennertus* delivers a pathology which entirely depends on the extraneous and evident irritation of ſubſtances deſcribed in the firſt part of this Inquiry; or, ſecondly, on the ſerous humour which the obſervation of preceding writers, and the experience of his own age, had concurred to eſtabliſh as the predominant ſymptom of Aſthma. He informs us, that the proximate cauſe of Aſthma is the ſtraitening of the bronchial tubes from compreſſion or obſtruction of humours often thick and viſcid; ſometimes thin and ſerous, but copious in quantity.

The hereditary diſpoſition to Aſthma is alſo ſtated to conſiſt in a certain laxity and weakneſs of the lungs, by which the organ is frequently more liable to receive a flux of humours, and to permit their accumulation. In the prognoſtic, he ſays, other ſymptoms beſides the pulſe and reſpiration muſt be attended to; for theſe may deceive the phyſician. Some patients die ſuddenly by ſuffocation, with a good pulſe; whilſt others, having a bad pulſation, are quickly reſtored by the diſperſion of flatus, or *the diſcharge of ſerous humour*. But though he does not oppoſe the common theory, that this diſeaſe ariſes from cold humours deſcending from the head, he is of opinion, that the flux proceeds ſtill oftener from the crude ſerum about the liver, and in the venous ſyſtem being carried into the lungs.

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* Tom. II. Lib. II. Part. III. Cap. 2.

According to Riverius* reſpiration is diſordered by cauſes ſympathic and idiopathic.

Amongſt the idiopathic is a ſerous or pituitous humour effuſed in the parenchyma of the lungs; ſo we muſt conſtrue "ſpongioſæ "pulmonis ſubſtantiæ imbibitur."

Though the generic application of the term Aſthma takes in all difficulties of breathing, its more particular meaning points out that diſorder of reſpiration which ariſes from the infarction and obſtruction of the bronchia, in its proper character, without fever, though ſometimes fever may attend. The diviſions of Aſthma are into Dyſpnœa, Aſthma, and Orthopnœa. The Dyſpnœa is inferior in degree to Aſthma and Orthopnœa, being the effect of leſs quantity of matter obſtructing the lungs; it is therefore without wheezing. Aſthma is then deſcribed with this attendant ſymptom: for, ſays the writer, in Aſthma, properly ſo called, the bronchia are filled with a pituitous humour, which, meeting the air in reſpiration, occaſions the ſound called wheezing. Orthopnœa is the extreme degree of this diſorder of reſpiration.

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* Vide Praxeos Medicæ, Liber VII. Caput 1.

The humour producing Aſthma is generally pituitous, and flows from the head into the lungs; ſometimes crude ſerum is tranſlated "a venoſo genere per arteriam venoſam in pulmonem." If this ſerum flows to the bronchial pipes, a true Aſthma with wheezing is produced; but if it ſtops in the ſubſtance of the lungs, and in the ſmall arteries, a ſpurious Aſthma, without wheezing, is the conſequence. This latter ſpecies of Aſthma, ſays Riverius, is unknown to phyſicians in general, who will acknowledge no other cauſe of the diſeaſe except a defluxion from the head. He then points out how it is to be diſtinguiſhed: it is not a form of that convulſive Aſthma now under conſideration, but ſymptomatic of obſtructions of the liver and lower viſcera, and ends in dropſy.

In theſe examples we may, however, ſee, that, in this period of medicine, ſerum was a permanent feature in the character of Aſthma; that, when a practical obſerver reflected on the various cauſes, he deviated from the authority of former experience, without deſerting that material indication; and that, if a pituitous flux from the head was occaſionally ſuperſeded, a flow of ſerum from the pulmonary veſſels took its place in the prevailing doctrines.

Caſes of Aſthma, ſo purely convulſive as to be independent of the influence of ſerous defluxion, muſt have been extremely rare; for they are not acknowledged as a ſpecies, nor ever clearly excepted from the general account.

Morgagni,* commenting on the doctrines relative to the cauſe of Aſthma, cenſures phyſicians for ſo generally adopting a theory of nervous convulſions, which, after the publications of Dr. Willis, they were ſeduced to eſpouſe from the facility and convenience with which a pathology could be maintained by their application. Theſe principles were ſo much abuſed in the opinion of that anatomiſt, as to be referred to when organic derangements were not abſent; and particularly in diſorders of reſpiration convulſions were as much accuſed at that time, as the vapours had formerly been by the ancient phyſicians. The criticiſm applies with great juſtice to many ſyſtematics, who have ſeized upon the authority of Willis, and greatly miſapplied his principles. They have taken up the extenſive influence of nervous communication, but they have neglected to conſider the force of vitious and abundant ſerum in exciting Spaſmodic Aſthma. For, whether this condition ſupports a connection with ſpaſm in the manner aſſigned by Willis, or is merely a habit of diſtinct conſideration, there can be little doubt of the exiſtence of an exceſs of fluid, as he would faithfully record a fact which the ſenſes of ordinary obſervers could enable them to eſtabliſh or confute.

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* De Cauſis et Sedibus. Lib. II. Epiſt. XV.

This will appear more convincingly if we examine ſome paſſages of the writings of that author, which ſhall be exhibited in his own words.

In ſpeaking of Cough and Aſthma, theſe affections, he obſerves, are ſaid to be ſometimes purely ſpaſmodic, without an organic fault in the lungs, but more frequently to ariſe from a ſpaſmodic cauſe, ſupervening on

the pulmonary affection, "oſtenſo ad hunc "modum quod tuſſis neque ſolummodo, "neque ſemper pulmonum vitio, ſed inter-"dum a cauſa ſpaſmodica ſolitaria, ſæpius "tamen ab hac, *affectioni pneumonicæ* ſuper-"inducta, oriatur; etiam de pathemate "quodam alio thoracico, ſcilicet *Aſthmate*, "fere idem pronuntiare non dubitemus."*

But though he may admit the pathology of a purely ſpaſmodic affection in ſome few caſes, a reference to his works will convince an inquirer of his acknowledgment and ſupport of irritation from ſerous humors in general inſtances. The procatarxis is in his language a redundance of theſe humors in the maſs of blood, and in the whole body:† "cujus materiæ portio quædam, arteriarum "oſculis in pulmones exudans, tuſſim ordi-"nariam creat; poſtea cum ſeroſa colluvies "adhuc in ſanguine exuberans, et particulis "ſpaſmodicis referta, etiam intra caput agge-"reretur, eadem nervos pneumonicos ſubiens, "tuſſim ſimplicem, in convulſivam adaugет."

This account of purely ſpaſmodic Cough or Aſthma, ſeems to give as much importance to material irritation as if he had entirely declined the conſideration of any other cauſe, for the prediſpoſition conſiſts in a condition of the blood leading to watery effuſion in the lungs, and the next ſource of convulſive motions is this ſerous colluvies, filled with ſpaſmodic particles, which change ſimple contractions into convulſive, by falling upon the pneumonic nerves.

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* Willis Opera. Tomus Prior de Morbis Convulſivis, Caput xii.

† Ibid Cap. xii. p. 137.

The ſerous colluvies is every where referred to, and may be ſufficient evidence of the author's opinion, becauſe hydropic effuſions have been ſeen. As to the *ſpaſmodic particles*, I can only judge of ſuch interference by the effects of the matter ſuppoſed to convey them. The hypotheſis will not be tolerated at the preſent day, but it is not leſs defenſible than many other theories, and the language is perhaps more in fault than the conception. It is not offering great violence to the ſentiments of the writer if we conſtrue his doctrine thus: "an hydropic habit pre-"vails in Aſthma, the watery condition of "the blood, and the atony of the arterial "veſſels precede the ſerous effuſſion into "the air cavities of the lungs. In this maſs "of extravaſated fluid, an *irritation* is found-"ed, which excites the convulſive actions "of the muſcles, intended to diſcharge it "from the organ."

" Nihil enim uſitatius, quam tuſſi in-
" veterata, aliave mala pulmonum diatheſi
" laborantes, demum *hydrope*, aut *ſcorbuto* ac-
" cedente, *Aſthmaticos* fieri: nempe cum ſan-
" guis, longe impurior factus, fæculentias
" *ſeroſas* etiam in capite deponit, hæ nervos
" pneumonicos utpote debiliores, et juxta
" extremitates ſuas crebro irritatos, promptius
" et quidem facilius quam alios ſubeunt, in-
" que iis *dyſpnœæ ſpaſmodicæ* materiem con-
" gerunt."*

The Dropſy, the Aſthma, and the Scurvy, are here united in the explanation of the convulſive diſorder.

In proceeding, the language is ſtill leſs ambiguous, becauſe he directly and plainly terms that form of Aſthma, *purely convulſive*, which ariſes from the ſerous colluvies of the habit, " porro interdum obſervavi, *graves*
" *Aſthmatis paroxyſmos*, ſine quavis notabili
" pulmonum labe accidiſſe; revera ut puta-
" verim, hunc *morbum* aliquando eſſe *mere*
" *convulſivum*, ejuſque inſultus ſolummodo
" excitari quoniam *ſeroſa colluvies*, particulis
" exploſivis referta, *nervos*, pulmonum dia-
" ſtolen perficientes, ſubiens, ſpiritibus
" ibidem ſcatentibus accrevit.†

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* Willis de Morb. Convulſive, Caput xii. p. 138.

† Ibid. p. 138.

Willis, it thus appears, had not in his contemplation a ſpecies of Aſthma entirely diveſted of the character which has been lately only given to the humoral Aſthma. Whilſt his authority has been followed by the noſologiſts and teachers of the modern ſchools of medicine, his meanings have been perverted, or his context not ſtudied. It is only by reference to his doctrine of Convulſive Cough and Aſthma in the twelfth chapter, *de Morbis Convulſivis*, and by conſidering his opinions, "*de Reſpirationis Læſæ Speciebus*," that his treatiſe "*de* "*Aſthmate*," which follows, can be properly underſtood. In the latter he alludes to his general theory of the cauſe of convulſions, and applying it in Aſthma, we are to follow his data when we accept his concluſions.*

In his chapter† "*de expiratione læſa*," he places cough as the principal effort of that action, and ſays the cauſes inducing it are *irritating*; in more fully deſcribing the ſituation of irritating materials, we are informed that theſe are ſometimes depoſited in the ultimate veſiculæ of the trachea, and are not expelled without vehement labour frequently repeated.

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* Vide Opera, Tom. Poſterior de Aſthmate, p. 125.

† Caput. IV.

This cauſe of cough elucidates the nature of the cauſe of Aſthma, and as will be explained hereafter, diſtinguiſhes the irritation which produces that diſeaſe. It is owing to the deep ſeat of the mucus, and its filling up the air cavities, that the action of expiration is generally impeded, and that the mode of expiration denominated cough, is, in the beginning of the diſeaſe, ſmall, interrupted and painful.

If any doubts can remain as to the ſentiments of this original author, it ſurely muſt be removed by more particularly adverting to his frequent experience of the hydropic effuſions which precede, accompany, or follow the Aſthma. I have plainly diſcovered, ſays he, by diſſection, that the cauſe of *Convulſive Aſthma* is ſometimes ſeated in the head at the origin of the nerves; ſome patients becoming Aſthmatic, were under the neceſſity of keeping an erect poſture of the head. If they reclined there was imminent danger of death.—After the head was opened, "ſeri acris colluvies ingens intra cerebri cavitates aggereretur."* He concludes his obſervations on the diſeaſe, by the caſe of a nobleman, who had for ſome winters been ſubject to a moderate cough and expectoration. At the cloſe of autumn he was at length ſeized with Aſthma.—

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* Willis de Aſthmate, Tom. 2. Cap. XII. p. 126.

After an attentive courſe of treatment, in which evacuants had perhaps too great a place, the phyſician purſues his hiſtory thus: "licet inſultus Aſthmatici parum aut minime eum "uti prius noctu inceſſerent, tamen ob pulmones plurimum infarctos, et humorem ſeroſum in pedes delapſum, citatius incedere aut "loca acclivia aſcendere, ſine gravi dyſpnœa, "et præfocationis periculo nequibat; jamque "(dum hæc ſcribo) deinceps non tam *Aſthma*, "aut *Phthiſis*, quam *Hydrops* timetur."

The remarks which follow the caſe are very important, and clearly correſpond with the pathology which is exhibited in his doctrine of convulſive motions; they undeniably ſupport the preſence of ſerous accumulation, and deduce the muſcular convulſions from the influence of ſuch effuſion. I ſhall therefore, take my leave of this writer, and finiſh a curſory review of his opinions, by preſenting the paſſage which cloſes his chapter "de Aſthmate." Deprecating however, in favour of eſtimable obſervation and experience of facts, too nice a trial of the juſt application of words which are evidently framed in compliance with the erroneous opinions of the day, and more particularly leaning to the hypotheſis of Sylvius on the craſis, the effervеſcences, the faults, &c. of the blood.—"Caſus hujus Ætiologia ex ſupra dictis ſatis liquet, viz. Aſth-

" matis hujus procatarxis una in pulmone valde " obſtructo verſabatur, proinde ut cum ſanguis " effervefcens præcordia impetuoſius pertranſiret, aër ad ipſum eventilandum requiſitus " non ſatis uberi copia admitti potuerit; quare " ad hunc defectum ſupplendum neceſſe fuit " pulmones, eorumque *organa motiva*, *in nixus crebriores et vehementiores incitari.* Poſtea dein hinc acceſſit fibrarum pectoris motricium *diathesis ſpaſmodica*: quippe *materies hetterogenea* una cum ſucco nerveo in " eas partes deſcendens, et ad plenitudinem " aggeſta, primo dolorem, et poſtea in organis " pneumonicis, ſpaſmos atroces, et periodicos " excitavit: jamque diatheſi hac poſteriori " quamvis ceſſante (quia ſcil. materies elaſtica et ſpaſmodica a *ſeroſa illuvie* obtunditur, " aut obruitur) adhuc tamen procatarxis altera " manet, alterumque comitem, viz. *Cacodæmonem ſeipſo deteriorem, ſc. hydropem conſcivit.*" *

Willis firſt eſtabliſhed the doctrine of convulſive motions in Aſthma, and ſucceeding writers have generally contented themſelves with adopting his theory. " It is aſtoniſhing," ſays Morgagni, " that Willis ſhould have been " the firſt who obſerved the nature of ſymp-

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* Willis, Opera, de Aſthmate, ad finem.

" toms, which we have univerſally, ſince his " time, acknowledged to exiſt in Aſthma."*

It is, indeed, truly remarkable, that phyſiologiſts ſhould have neglected to notice, that the contraction of any muſcle performed with greater frequency or more energy than is common in health, ſhould aſſume the type of convulſion or ſpaſm; for convulſion is nothing but a too ſtrong contraction of the muſcle or fibre, and reſpiration being only exerciſed by contraction of muſcles; if that contraction is ſtronger than the purpoſes of ordinary health demand, it may be juſtly ſaid to have become convulſive or ſpaſmodic.

But if ſurpriſe is excited by the nature of the contractions in Aſthma not having been aſcertained before the time of Willis, ſtill greater wonder may be expreſſed that ſubſequent authors ſhould have been ſo much occupied in contemplating the new actions, as to forget the evidence of the ſtate of the habit in which they were ſaid to take place, and which was by Willis eſteemed ſo prominent and conſpicuous, as to be the very cauſe exciting the morbid motions which he deſcribed.

It would be next in order to conſider the opinions of Floyer, Hoffman, and Cullen, but having arrived at the baſis of their ſuperſtructure, or rather at the very building which they protect, though they have neglected to preſerve its integrity, I ſhall previouſly take a view of the evidence afforded by anatomical obſervation.

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* Morgagni. Lib. II. Epiſt. 15, 5.

SECT. VII.

Anatomical evidence of ſerous effuſion in the veſiculæ of the lungs of Aſthmatics.—Effuſion in complicated caſes very frequent; in uncomplicated caſes ſeldom inquired for, but occaſionally diſcovered.—A ſeries of Anatomical Obſervations applying to complicated and uncomplicated Convulſive Aſthma.—The Suffocative Catarrh conſidered.—Evidence in Living Subjects of exceſſive Effuſion in the Veſiculæ of the Lungs, as palpable as from Diſſection.—This Condition ſupported by the Deſcription of Aſthma by Cælius Aurelianus.--Phyſiological Conſiderations on the Entrance of Serum into the Air Cavities of the Lungs.—The Experiment of Dr. Goodwin.—The Authority of Dr. Hales.

ASTHMA is very ſeldom fatal in its uncomplicated form, and therefore few opportunities have occurred to examine the ſtate of the lungs. I am not acquainted with any obſervations of practitioners diſcovering the reſult of anatomical inquiry after the cauſe of merely Spaſmodic Aſthma. For this *Morbus Maxime Terribilis*, as it is called by Willis, may be carried on to old age, if ſupervening diſeaſes do not cut ſhort the patient, or diſturb the operations of nature by which recovery from the paroxyſm is accompliſhed. When the progreſs of the diſorder is not favorable, Dropſy or Apoplexy are the diſeaſes which are commonly known to alter its character and deſtroy the patient.

Many inſtances may be found of effuſion in the veſiculæ of the lungs from theſe complicated cauſes; but as an organic alteration of ſtructure has been frequently diſcovered in the thorax, preceded by ſymptoms which greatly excited medical curioſity, diſſection has ſtill more generally expoſed effuſions in the ſacs of the pleura and in the pericardium. Theſe are ſo often conſequences of inflammation, polypi in the large veſſels, or oſſifications of their coats, that opportunities muſt have occurred of anatomical evidence of the fact as frequently as the profeſſion could require.

The termination of uncomplicated ſpaſmodic Aſthma is, on the contrary, not likely to be the object of examination: for, when the pulſe has been equal, and ſudden death has not cloſed the ſcene, the inquiry into cauſes is not urged with eagerneſs, nor purſued with anxiety. But it will be acknowledged, that ſuch a cloſe of the diſeaſe is not to be expected.

I

An acute diſorder may come upon the Aſthmatic, and the contents of the thorax may be found marked with the conſequences of inflammation: Dropſy may generally pervade the habit, and effuſion will be found in the cavity of the breaſt, or in the cellular ſubſtance, as well as the veſicles of the lungs; or it may only be found in the ſacs of the pleura, and the cells of the lungs may have been relieved by the operation of natural abſorption; for whilſt that power is alive, it may be expected to uſe its energies in defence of the laſt reſervoir of vital ſtimulus.

It was not always a ſubject of wonder, that the lungs ſhould be found filled with ſerous fluid; we therefore are not to be extremely ſurpriſed, that the preſence of this matter ſhould be neglected amongſt the probable cauſes of Aſthma. Though Morgagni frequently diſcovered this condition of the air veſicles after death, when the patients had laboured under diſordered reſpiration, he generally contents himſelf with recording the fact; and dwells with more attention on the alterations of organic ſtructure, which, in theſe inſtances of complicated diſeaſe, he had an opportunity of remarking. The effuſions into the cavities of the cheſt and the pericardium are more carefully noticed than effuſions in the veſiculæ and bronchia; the latter could not, in caſes commonly occurring, be productive of death; the former are, indiſputably, frequent cauſes of fatal iſſue, though their preceding ſymptoms are leſs diſtreſſing than the paroxyſm of convulſive Aſthma.

We are therefore not to expect ſuch a ſeries of facts, nor ſo copious a hiſtory of evidence of morbid effuſion in the air cavities of the lungs in caſes of ſimple, uncomplicated, Spaſmodic Aſthma, as in caſes where that might be the attendant diſorder, but where life was terminated by one of more deciſive violence.

But as there is ſome light to be obtained from examination of theſe complicated caſes, we ſhall preſent a few of the more prominent inſtances; not doubting, at the ſame time, of a very accurate ſearch being anſwered by more extenſive ſatisfaction.

I ſhall likewiſe be determined by the account of ſymptoms, to claim for the advantage of our inquiry caſes which may be claſſed under other heads, but which I believe to belong to convulſive reſpiration.

OBSERVATION I.

Morgagni's obſervation of morbid bodies had induced him to give a ſpacious opinion, which may apply very cloſely to our aſſigned cauſe of Aſthma. He ſays, that concretions in the bronchial tubes, and indurations of their glandules, very often aroſe from viſcid humours, or pus remaining too long in theſe paſſages, or the air cells at their extremities:* this is informing us in other words, that after fluid matter has been preſent to occaſion Periodic Aſthma, it is capable of becoming the cauſe of Continued Aſthma; a ſpecies which has been treated in the firſt part of the Inquiry, where may be found much authority in ſupport of the reaſonableneſs of his ſuggeſtion.

This author preſents us alſo with ſome detached facts, which are to be claſſed as complicated caſes of Aſthma.

OBS. II.

The lungs of an Aſthmatic ſubject, deſcribed Epiſt. XXII. Art. 4. were found in the following ſtate: — The right lobe was ſound, but in the lower part very red; the left was univerſally pale, contracted, and hard, and contained ſanious matter.

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* De Cauſis et Sedibus. Lib. II. Epiſt. XV. Art. 19.

OBS. III.

Article 34. Epiſt. XVIII. A hiſtory of the diſſection of a patient, whoſe diſeaſe was denominated Convulſive Aſthma.

The heart was diſeaſed, and the lungs were filled with a frothy liquor; but there was no effuſion in the cavity of the cheſt.

OBS. IV.

Article 30. Epiſt. XXI. A diſeaſe of the breaſt is reported, which was accompanied with laborious reſpiration. The air cavities of the lungs were found to be filled with frothy ſerum.

OBS. V.

In the ſame Epiſtle, Article 33, a ſimilar diſcovery is recorded: but in this patient, who was a ſoldier, the diſorder of reſpiration had been attended with fever, as well as uneaſineſs and pain in the cheſt.

OBS. VI.

Morgagni, as well as other anatomiſts, records many inſtances of ſerous effuſion, after pneumonic inflammation. This conſequence of ſuch a ſtate of the lungs will be readily accepted without diſpute.

Dr. Hamilton* has applied the obſervations of Morgagni to a very uſeful purpoſe ; and treating of pneumonia gives ſeveral caſes, which, on the authority of the latter, confirm the fact of effuſion from pulmonary inflammation. See Caſes X. XIII. XVIII. XIX. XXIV. XXXII. XXXVIII.

OBS. VII.

Fabritius Hildanus opened a ſubject, who became aſthmatic after a concuſſion of the brain. The diſeaſe ended fatally from the occurrence of a catarrh falling on his lungs. The lungs were found every where filled with pituitous and viſcid fluid. See Cent. I. Obſ. XI.

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* Obſervat. on the ſeats and cauſes of diſeaſes, with Morgagni's diſſections. Vol. I.

OBS. VIII.

Hollerius, Prax. Lib. I. Cap. 25. in ſcholiis, has informed us of an Aſthmatic, in whoſe lungs, after death, the ſame pituitous fluid was found as in the preceding caſe.

OBS. IX.

A woman of forty years of age is ſtated to have died of Aſthma; but ſhe had alſo a ſtone in the kidney. A great quantity of frothy water was found in the cells and bronchia of the lungs.

This anatomical hiſtory is given us by Frederic Ruyſch. See his works, Tom. I. Obſ. LVI.

OBS. X.

For another inſtance of this morbid appearance in the lungs of a ſubject, who had ſuffered the Aſthma, ſee Riverius, Obſervat. LX. Centur. I.

OBS. XI.

An Aſthmatic died, and his lungs were found filled on both ſides with ſerum; but there were likewiſe adheſions to the diaphragm and pleura. The pylorus was diſeaſed, and alſo the duodenum and pancreas: the pineal gland was full of white concretions.

This diſſection is communicated by H. Ridley, in his Obſervations de Aſthmate et Hydrophobia. They are given in German with Floyer's treatiſe, by Joanne Chriſtian Frederic Scherf.

OBS. XII.

In the ſerous apoplexy the condition of the habit is exhibited very commonly by effuſion in the lungs, as well as the brain; diſſection proved this in one inſtance which I treated. When the lungs were cut open, the bronchia and veſiculæ were found to be filled with frothy ſerum; and the ventricles of the brain contained a ſerous fluid in unuſual quantity. The ſtertorous breathing in this patient was very remarkable, and ſeemed not leſs to partake of wheezing, as the ſound is termed in Aſthmatics, than of the ſnoring which belongs to apoplexy.

OBS. XIII.

Morgagni, in treating of ſerous apoplexy and lethargic affections, gives ſome diſſections which ſhew this morbid condition of ſerous effuſion in the lungs, as well as the brain. See Article 16, 24, 26, of Epiſt. IV. and Art. 12. of Epiſt. VI.

OBS. XIV.

The extreme caſe of ſerum in the veſiculæ muſt be when accidental or concurring diſeaſes have ſo weakened the patient, that the irritation of the matter cannot excite the powers of the habit to eject the inconvenience; when ſenſibility or irritability is at ſo low a point, ſuffocation may be apprehended, but it has never occurred, except from the prevalence of ſuch occaſional cauſes in convulſive Aſthma. There are inſtances of ſuffocation when the debility of the ſubject has been intenſe; and others have been often recorded, where, from a ſimilar condition, the danger of this event was imminent and great.

Morgagni* gives the hiſtory of a maiden ſubject, who died with a fluid running out of her mouth. She had been invaded by diſeaſe from taking cold at the time of menſtruation; and difficulty of breathing was a reigning ſymptom. The abdominal viſcera and uterus were in a very morbid ſtate; but the lungs were diſtended with a *frothy ſerum.* The diſſection does not prove that ſhe died from the ſtate of the lungs only, but that an effuſion had taken place in that organ; and it is to be deduced, that the natural effort of reſpiration was unequal to contend with that particular affection, for the fluid iſſued from her mouth agreeably to the feature which Cælius Aurelianus has given in his deſcription of Aſthma; and in this paſſive ſubmiſſion of the ſyſtem to the violence and extent of the diſeaſe, ſhe expired. An inſtance ſimilar to this, as far as regards the affection of the lungs, will be ſeen in a patient, who ſurvived the diſcharge, and whoſe caſe is an acknowledged Aſthma.

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* Epiſt. XXI. 29.

But it would comprehend too extenſive an inquiry if I was to proceed without a limit in the examination of caſes of Aſthma, complicated with abdominal diſeaſes, and organic derangements of the veſſels of the thorax, in which the particular condition of the veſiculæ, to which I attribute the convulſive reſpiration of uncomplicated Aſthma, is to be found by anatomical induſtry.

I ſhall, therefore, confine myſelf to ſome ſelect caſes, which, whatever name may have been impoſed upon them, are, in my opinion, evidently inſtances of Spaſmodic Aſthma; but without affording ſubject of theoretical debate, by a connection with chronic diſeaſes of the viſcera, except ſuch as Aſthma may be allowed to produce.

OBS. XV.

" In opening into the cheſt," ſays Dr. Baillie,* " it is not unuſual to find that the " lungs do not collapſe, but that they fill " up the cavity completely on each ſide of " the heart. When examined, their cells " appear full of air, ſo that there is ſeen " upon the ſurface a prodigious number of " ſmall white veſicles; the branches of the " trachea are at the ſame time much filled " with a mucous fluid. This is not un" commonly the caſe in perſons who have " laboured for ſome conſiderable time with " difficulty of breathing, but without any " ſymptoms of inflammation; ſuch perſons " would appear to die from want of a ſup" ply of atmoſpheric air ſufficient to pro-

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* Morbid Anatomy, p. 50.

"duce the proper change in the blood, "which is neceſſary for its uſeful circula- "tion through the body."

OBS. XVI.

A maſon was admitted an out patient of the Leiceſter Infirmary in the year 1786. He had been affected with aſthmatic complaints for ſeveral years, and traced the origin of his diſorder to a ſevere cold, after having been confined with the rheumatiſm. The habit of this man was thin, and his temperament inclined to ſanguine; his paroxyſms of the Aſthma had been moſt ſevere in the winter, but had frequently attacked him in the milder ſeaſons. He had purſued his labour without much conſideration of his diſeaſe; and generally allowed himſelf but one day of reſt for the paroxyſm to abate. At the time of his admiſſion he had been alarmed by the opinion of his apothecary, that he had an aneuriſm of the aorta, or a polypus in the ventricles of the heart. I perceived that this opinion was founded on the pulſations at his wriſt, which were frequently indiſtinct, and at other times intermitted; occaſionally I remarked the beat of the artery to be large and throbbing.

His feet were œdematous, his countenance pale, his breath always ſhort; he had ſome cough, but he only expectorated after the paroxyſms. The acceſſions of his diſorder preſerved their character: he had ſevere approaches in the evening; and if he was free ſome weeks from ſtrong ſymptoms, the invaſion of the fit was truly regular in the manner of Spaſmodic Aſthma. I did not attribute the irregular pulſe to a diſeaſe of the heart or large veſſels; but directed ſome emetics and abſorbents for the ſtomach: after the uſe of theſe the pulſe was more regular. He then took expectorating and diuretic medicines, with great relief; and after ſome weeks was at leaſt ſo well as to abandon his phyſician. His pulſe had reſumed its former ſtandard, his appetite was mended, his flatulence gone, expectoration much more free, urine natural, reſpiration not much diſturbed by exerciſe, and the paroxyſms loſt. At the commencement of the ſucceeding winter I was deſired to call upon the ſame man, who having been greatly expoſed to wet and cold was laid up in his own dwelling. I was requeſted to receive him into the Infirmary; but it appeared improper, becauſe his difficulty of breathing was too conſiderable to bear the air of an hoſpital; and the ſymptoms were ſo critical as to leave little expectation of his living through the night. The application of bliſters to the breaſt and legs ſeemed to encourage hope, for his pulſe was raiſed after they began to draw. A mixture of oxymel ſcillæ, and ipecac. wine, puked him once with advantage; after four hours it was repeated, but it acted only upon the bowels; ſeveral looſe ſtools were diſcharged, and he ſunk under his weakneſs, having had a regular acceſſion of the paroxyſm two nights before, which had not been ſucceeded by expectoration. I was permitted to open the body, an object which had induced me to frequent the patient with ſome aſſiduity after I perceived the improbability of his ſurviving the ſtate of weakneſs and laborious reſpiration in which I found him.

The abdominal viſcera exhibited no mark of diſeaſe, the bowels were emptied of fæces, and the ſtomach was very flaccid, and expanded in the coats; the head contained no exceſs of ſerum, but the veſſels were rather turgid; the lungs were very heavy, and being preſſed, a frothy liquor was made to iſſue from his mouth. The ſubſtance was then cut open, and the cells and bronchia were found full of ſerum, of a light colour, un-mixed with blood; there was no water in the pericardium, nor in the ſacs of the pleura, except the uſual moiſture; the heart and large veſſels were natural. After the ſerum had been diſcharged by preſſing the lungs, the mucus which ſtill adhered to the coats of the veſicles appeared more frothy than the general maſs, and was alſo of a darker colour, making the membrane in ſome places nearly black.

The diſeaſe deſcribed by Dr. Millar has been ſubject of doubt; Cullen places it under Cynanche Trachealis, and conſiders it as the Croup. It is, however, not clear, that Spaſmodic Aſthma would be a different diſeaſe from that which Dr. Millar obſerved, if it attacked infancy only; at all events it was a diſorder of reſpiration, and admitted of noſological diſtinction as far only as it was accompanied with fever and inflammation. In the extreme irritability of an infant ſubject, inflammation may occur in the courſe of ſymptoms, ariſing from cauſes obſtructing the air veſicles, when in adults theſe cauſes may induce aſthmatic paroxyſms, without exciting fever, or ſo much ſenſation as to inflame the organ; for theſe reaſons it may be proper not to omit the obſervations of Dr. Millar on the morbid appearance of two infant ſubjects.*

OBS. XVII.

A child died in the firſt ſtage. The external parts were ſoft and œdematous; the lungs, and all the other bowels, were ſound; the ſtomach and inteſtines much inflated with rarefied air, but contained no fæces.

In this inſtance there is no difficulty in concluding that the child was carried off by a convulſion, in ſo early a period as to prevent the diſorder from taking the character of a pulmonary diſeaſe. The great diſtention of the ſtomach permits the inference of indigeſtion having been a previous complaint, and that the firſt paſſages were very feeble; this condition might ſuddenly induce difficulty of breathing, by preventing the deſcent of the diaphragm; and, in the irritability of infancy, the conſequences which happened are not uncommon. The abſence of inflammatory appearances in this diſſection will not allow the ſuppoſition of the Croup having deſtroyed the child.

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* Vide Dr. Millar on the Aſthma and Hooping Cough.

OBS. XVIII.

A child died in the ſecond ſtage deſcribed by Dr. Millar. She had laboured under violent ſymptoms of the Aſthma till the tenth day.

The veſſels of the pleura, on the ſurface of the lungs, and of the trachea, were turgid, and ſeemed obſtructed; the parts had a livid appearance, reſembling that which is obſerved when an inflammation terminates in a gangrene; the bronchial veſſels were filled with a white, tough, gelatinous ſubſtance.

The *Suffocative Catarrh* is deſcribed by Schneider as follows: — " It is allied to the " apoplexy and ſyncope, but is diſtinct from " thoſe affections: the diagnoſtic ſigns are, " a weight and pain of the breaſt, a diffi" culty of reſpiration, an interrupted voice, " danger of ſuffocation, anxiety, ſometimes " a cough, a ſlow pulſe; the membrane " lining the noſe and mouth before and be" hind diſcharges a flux of ſerum, with " which the mouth is occaſionally filled."*

If wheezing had been a ſymptom deſcribed by Schneider, and the inflammation of the mucous membrane of the noſe and mouth had been omitted, the character given of Suffocative Catarrh would not have been improperly applied to Spaſmodic Aſthma: there is, doubtleſs, a diſtinction between the diſeaſes; but there may be ſubjects affected with this Catarrh in whom the line of ſeparation will be loſt.

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* Schneiderus de Catarrh. L. V. C. 4.

If the tone of the capillary exhalents of the lungs be reduced to a low point, and if this condition occurs in a habit diſpoſed by cuſtom to a ready aſſociation of muſcular contractions, and particularly of morbid contractions of the reſpiratory muſcles, Aſthma will be the diſeaſe occaſioned by the defluxion, which in other ſubjects might be called Catarrh, or, according to Schneider, Suffocative Catarrh.

OBS. XIX.

The hiſtory of the Catarrh which prevailed in Italy in the year 1730,* gives a ſpecimen of Aſthma terminating the more acute diſeaſe. The cardinal Johannes Franciſcus Barbadicus yielded to his diſorder, which

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* The epidemic catarrh, or influenza, raged on the Continent, 1580, 1675. See Bergerus de Circul. Lymphæ. C. II. §. 7. Foreſtus. Lib. VI. Obſ. 3.

Morgagni calls a Suffocative Catarrh, and which was probably a ſpecies of that epidemic which is now called influenza by the admirers of novelty: whatever was the affection under which the cardinal laboured, its progreſs was marked by ſo conſiderable a diſorder of reſpiration as to merit the name of Aſthma, and when expectoration could be no longer exerciſed, the patient died from ſuffocation. His lungs were found full of ſerous fluid; but there was no adheſion, or other mark of inflammation. His phyſician's words are as follow:—"Graves erant ipſi "pulmones, ſed a catarrhali, quam contine-"bant, materia, multa paſſim e bronchiis, "quacunque incideres, erumpente. Certe "eorum omnis ſubſtantia flaccida, non mo-"do non denſa, aut compacta reperta eſt." The ſubject was gibbous, and ſeventy-two years of age, and as he had been frequently affected with defluxions on the lungs, the termination of the diſorder could excite no ſurpriſe, any more than the morbid appearances on diſſection. Had this plentiful effuſion of mucus, or ſerum, invaded the pulmonary function of a younger man, whoſe irritability had been leſs exhauſted by age, the actions of the reſpiratory muſcles, and of the abſorbing veſſels, would have been rouſed to energy equal to the taſk of delivering the organ from the oppreſſive offence; and the patient would probably have recovered, to fall under the ſymptoms at a future attack.

Morgagni relies much on the prediſpoſing cauſe of a gibbous ſpine, which, he ſays, repreſented the letter S; and he adverts to the caſe of a ſimilar ſubject of high rank, whoſe ſpine had the ſame form, and whoſe lungs were filled with a fluid of the ſame kind. Thoſe who ſaw the diſſection, ſays Morgagni, very rightly adopted the opinion of Heucherus:—" Sigillatim hi catarrho ſuf-
" focati cenſendi ſunt, quibus ſerum, ſeu
" lympha ſanguinis, quacunque de cauſa;
" vitiata, copioſius reſpirationis organa occu-
" pat, et in bronchiis veſiculiſque pulmonum
" pertinaciſſime reſtagnat."

The Suffocative Catarrh was conſidered by Morgagni as the diſeaſe of theſe ſubjects: the former, he particularly aſſerts, was not affected before he died with any ſymptom of peripneumonic fever, nor were any ſigns to be diſcovered in the lungs of ſuch an affection, after death. This diſtinguiſhed the caſe from that deſcribed by Jo. Seb. Albrechtus,* which was called ſuffocative, and was fatal to the patient; but in this caſe a peripneumonic fever ſupervened upon the epidemic affection. We may ſafely ſay, that the reverend Cardinal expired under a paroxyſm of Aſthma, in which the convulſive motions were as ſtrong as the irritability of the patient would admit.†

OBS. XX.

An eccleſiaſtic advanced in life, with a ſhort neck, and fat, had been long out of health: he led a ſedentary life, and was cachectic. *(Cocochymiam valde ſcorbuticam contraxerat.)* He was ſo affected with difficult and laborious reſpiration, and heavineſs and torpor of the head, that he was capable of no exerciſe, except the going to chapel and returning every day. He was ſeized in the execution of his duty with inſenſibility, and fell on the ground; he was taken up, and put into a warm bed. When the phyſicians arrived they found him with-

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[*] Vide Commerc. Litter. A. 1743.

[†] See Morgagni, Epiſt. XIII.

out pulſe, reſpiration, or ſenſe, and his body cold and ſtiff; he was therefore unaffected by the medicines which were applied. The ſucceeding day the body was opened; and there was no doubt of a diſeaſe ſo ſuddenly fatal having left veſtiges in the brain, where the cauſe probably lay. The encephalon was accurately examined, but, to the ſurpriſe of all, was found in its contents. "*Morbi, licet atrociſſimi ne vel umbra quæ-*" *dam ſupererat.*" Proceeding to the thorax, the heart was found perfectly firm, and entirely free from any obſtruction or polypous concretion. The cauſe of the laborious reſpiration, and ultimately of the death of this patient, was at laſt diſcovered in the ſubſtance of the lungs, this organ being diſcoloured, and its veſicular cavities entirely filled with a *frothy ſerum.*[*]

Proofs of ſerous effuſion in the veſiculæ of the lungs may, I have little doubt, be found in much greater extent, by careful examination of morbid bodies, and more particularly in ſubjects who had been affected with diſordered reſpiration. I have been chiefly deſirous of giving evidence to elucidate the cauſe of the *uncomplicated* Spaſmodic Aſthma. Anatomical obſervation has furniſhed ſome inſtruction in this inquiry, and ſtill more is to be obtained from a conſideration of ſome prominent appearances in the paroxyſm of Convulſive Aſthma, when, fortunately, the patients did not ſink under the extreme urgency of their affections: theſe appearances have not commonly occurred; and ſtill more ſingular is a recovery after they have marked the debility of the habit, and extreme ſeverity of the caſe.

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[*] Boneti Sepulchret. Anatom. Lib. I. Sect. II. Obſ. 57.

In the fourth part of Conſiderations on the Medicinal Powers of Factitious Airs, by Dr. Beddoes and Mr. Watt, we have a caſe by Mr. Baynton,* which very clearly illuſtrates this pathology, and ſhews even more than a diſſection could exhibit of the genuine cauſe of Convulſive Aſthma: it is juſtly conſidered by that practitioner, and by Dr. Beddoes, as an inſtructive and important hiſtory. After a train of ſymptoms, which frequently precede Spaſmodic Aſthma, a Female Patient was ſeized with a complaint that very much reſembled the paroxyſm of that diſeaſe; it was, however, more violent than firſt attacks uſually are, and its remiſſion was attended with a very copious diſcharge of *frothy ſerum* from the bronchial tubes, which was thrown up by a ſlight, though almoſt continual, cough. Remedies were purſued, with the advantage of occaſional relief; but the diſeaſe reſumed its former violence after the interval of ſixteen months. She was attacked, after comfortable reſt, at five in the morning, with Dyſpnœa and Convulſive Cough; danger of ſuffocation was ſoon perceived; the ſenſes forſook her, the face became livid, the extremities cold, and the pulſation at the wriſt was loſt: this ſtate continued for two hours, during which time a very large quantity of frothy ſerum, tinged a little with blood, was diſcharged, without any viſible effort, by the mouth and noſtrils. "Then ſome very faint and involuntary efforts to cough came on, which gradually "increaſed, *and with every effort large quantities of the frothy ſerum were thrown off; perhaps the whole quantity might amount to three "or four pints.* About three hours after the "time of attack, the difficulty of breathing "became very ſenſibly diminiſhed, and her "ſenſes were obſerved to return." Dr. Beddoes, in his commentary on this narrative, ſays, the fluid which was diſcharged was aſcertained, by careful inquiry, to be *mucus*, and not ſaliva. The prediſponent cauſes were ſuch as lead to Spaſmodic Aſthma; and Dr. Darwin conſidered it, as well as Dr. Beddoes, to be an extraordinary inſtance of that diſorder. That a retrograde motion of the lymphatics ſhould be called in to explain the ſymptoms, is of little conſequence to our inquiry, which is only to inveſtigate that poſitive condition of the air cavities of the lungs, in which ariſes the irritation inciting convulſive actions of the muſcles of reſpiration.

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* Vide p. 53.

The aſtoniſhing accumulation of ſerum is, in fact, the only wonder in the caſe; for an accumulation more moderate and controulable is to be ſuppoſed, where no excretion is obſerved; and we muſt be very inattentive indeed, in applying the powers of abſorption to the diſorders of the pulmonary organ, if we give to that function no importance in caſes which analogy ſo ſtrongly indicates to be caſes of morbid exhalation, or ſerous effuſion.

But though I attribute to the hiſtory here alluded to, marks of very fortunate evidence of the cauſe of the diſeaſe, and though ſuch evidence cannot commonly be expected to be expoſed to our ſenſes, from the vigilant activity of abſorbing powers exerted to prevent conſequences ſo conſiderable from the atony of the exhalent capillaries, yet the deſcription is not ſolitary in the annals of medicine. An important caſe is to be ſeen in the works of Alex. Monro, ſen. in which the pulſe became indiſtinct, and ſlimy mucus was diſcharged in an unuſual quantity. Œdema of the feet and legs was an attendant ſymptom, and the progreſs of the diſeaſe diſcovered the diatheſis to be decidedly hydropic.* Here the ſame mucous fluid was diſcharged from the lungs, but its accumulation was more gradual, and the irritability of the habit was not ſo deficient as in the female patient; for the expectoration anſwered to the exciting cauſe in leſs proportions of force.

It has appeared that the ancient writers recorded defluxions on the breaſt very generally in Aſthma, which they attributed to a deſcending of ſerum from the head. It is to be lamented, that a falſe theory ſhould implicate in its diſgrace the hiſtory of ſymptoms which accompanied it: the ancient authors have probably for this reaſon been too much neglected by thoſe, whoſe erudition would have ſuſtained no injury by reference to their fidelity of obſervation.*

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* Works of Alex. Monro, ſen. p. 604.

Cælius Aurelianus† makes this exceſs of mucous fluid a diagnoſtic ſymptom in the very ſevere caſes of Aſthma; and it is remarkable, that this reference to the moſt violent ſtate of the diſorder takes away all doubt of the ſerous flux belonging to that form which is called convulſive. After mentioning the common ſymptoms in which are included wheezing, a cough dry, and then moiſt, ſpittings thin and frothy, and afterwards more thick and viſcid, he proceeds to ſay, "At ſi gravior impetus ſuper-" "poſitionis ‡ fuerit, ora ægrotantium li-" "veſcunt, et quidem excluſo per nares hu-

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* When I converſed with a zealous ſyſtematic, whoſe genius will be long remembered, though his moderation and his judgment have too little ſupported its reputation, on the medicinal obſervations of Jodocus Lommius, he aſſured me, that "he had "long determined not to read, becauſe he would not be cor-"rupted; he had diſcovered truth, and he would adhere to it." But is the hiſtory of appearances to be neglected, becauſe their aſſigned cauſe is not ſatisfactory to the ſtudent? The accuracy of obſervation and fidelity of delivery, which characteriſe the writings of the Greek claſſics in medicine, will not be excelled by modern authenticity.

† Morborum Chronicorum. Liber III. Cap. 1.

‡ Superpoſitionis, i. e. *Paroxyſmi*, ſecundum Lexicon Cælianum.

"more mucilento, relevantur, atque præ-"focationis carent metu, quod non aliter "cedit, etiamſi per oculos lacrymarum fuerit "fluor."

It is not to be unobſerved, that the commentator on this writer, Jo. Conradus Amman, adds the following remark: "Cum "enim per nares id exit, avertitur humor "in pulmonem fluxurus, et intercipitur ali-"aque via rejectus periculo ſuffocationis li-"berat."

Here we ſee how very averſe phyſicians were to allow the flux of ſerum in the lungs any other ſource than the head; though it admits of no diſpute, that entrance of ſuch humours into the trachea would be precluded by the moſt determined reſiſtance of the muſcles of expiration, and the ſhutting of the glottis: this is the effort of an animal immerſed in impure air; the natural niſus to inſpire good air is counteracted by the more powerful averſion from bad; and the ſenſation of receiving in the trachea a fluid ſo denſe as water, in the act of drowning, excites an inſtinctive expiration to expel it; and though the attempt to obtain air in the lungs is again repeated, the ſame impulſe of averſion is renewed, and very little water is admitted, though the lungs are in a ſtate of collapſe from want of air.*

This paſſage of ſerous fluid had, however, been perfectly confuted by Schneider; and Van Helmont was not ignorant of the active oppoſition which would be excited in the muſcles of expiration, to prevent the entrance of a drop of limpid water into the larynx. "Si quidem, ſi unica aquæ gutta, "incaute deglutiendo, in laryngem deci-"dens, præfocationis metum potanti incu-"tiat, quid non faceret tanta mucci copia "quæ pelves parvo ſubinde ſpatio implet."†

But if a ſingle drop of water affects the larynx, and excites ſo much energy of reſiſtance to its paſſage, the inſidious entrance of ſerum into the veſiculæ is not productive of ſuch acute diſtreſs. That it may be borne in theſe cavities without inſtant death, when it has taken poſſeſſion, is proved by Dr. Goodwin. He poured water through an opening into the trachea of a cat: the experiment induced great difficulty of breathing, and a feeble pulſe; but the animal recovered, in repeated inſtances, from the ſudden impreſſion, to a ſtate of ſeeming eaſe.*

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* See Mr. Colman's Diſſert. on Suſpended Reſpiration, p. 3, 143, &c.

† Ortus Medicinæ Catarrhi Deliramenta, 38.

Dr. Goodwin finiſhed his experiments on cats by deſtroying the animals after a few hours. It would have been more ſatisfactory to have heard what ſymptoms appeared in a longer time; with this view I made the following experiment, which, with ſome modifications, was repeated on cats. Theſe animals are more tenacious of life than moſt others; and I found that they would take a greater quantity of fluid into the lungs, without immediate ſuffocation, in proportion to their bulk, than the dog.

EXPERIMENT.

I confined a dog in an erect poſture, and with the aſſiſtance of an ingenious friend, opened the trachea, and poured in four ounces of ſerum of cow's blood, warm; the paſſage was then properly cloſed. The dog was ſet at liberty within the bounds of a kennel, three feet by four, and open to the air in the front; he was affected with great difficulty of breathing, lay down panting, but ſuddenly aroſe with great emotion, and continued on his legs, with quick reſpiration, for ſome time. The diſtreſs gradually diſappeared in four hours; but he refuſed food, and appeared to ſleep. In ſixteen hours he appeared to become unruly, and made violent efforts to releaſe himſelf: broth and oatmeal was given him, which he at firſt took with eagerneſs; but he ſoon left off eating, and was as reſtleſs as ever; his reſpiration very laborious, his eyes ſuffuſed with water; the floor of the kennel was very wet, and I obſerved that he paſſed urine. After this ſtate had continued till the twenty-ſixth hour from the operation, with more or leſs Dyſpnœa and anxiety, he became much more quiet: his breathing in thirty-four hours appeared to be natural; but he then began to rub his neck, and ſcratch the wound. It was ſoon perceived that a great inflammation was come upon the integuments; and from the trouble which the animal gave, and the pain he was in, I directed him to be ſtrangled. Upon opening the lungs, there was collected one ounce and a half of fluid, which was much more ropy than the ſerum poured into the trachea; two ounces and a half, with any ordinary mucus which was natural to the pulmonary cavities, had therefore been abſorbed, or exhaled in the vapour of the dog's expirations.

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* Connection of Life with Reſpiration, p. 17.

It is probable, that if the cats had been ſuffered to live ſome hours longer after the experiments of Dr. Goodwin, the water in their air cavities would have been abſorbed: the ſhort time allowed to them had, on the contrary, increaſed the quantity of the fluid; an effect of the local irritation of the capillary mouths, before the increaſed action of the abſorbents had commenced, and this concluſion is ſupported by the trials which I made on ſeveral cats; becauſe in three which were not ſuffocated by the fluid poured down the trachea, the water was abſorbed in two days, and I found that ſix ounces was the moſt they could receive. This quantity deſtroyed two cats, and more than this ſuffocated ſeveral.

It appears by the experiments of Dr. Hales, that water poured into the wind-pipe may paſs through the bronchia into the pulmonary artery; but in the reverſe direction the paſſage of this fluid is ſo free, as to run from the artery into the air veſſels four-fifths faſter.

Water run out of the artery into the windpipe of a hog at the rate of a pint in a minute: this effuſion would proceed only from the artery. When the experiment was tried of pouring water into the pulmonary vein, it would not paſs into the artery or bronchia, though the ſame force was uſed.

Serum of a hog's blood was afterwards tried, and it paſſed from the pulmonary artery moſt freely into the bronchia, but not into the veins.

In purſuing his experiments on a calf's lungs, warm water was poured into the pulmonary artery; the lungs were dilated from a large pair of bellows; the water flowed ſo freely from the capillary arteries into the veſicles, and thence into the bronchia, as to flow plentifully through the windpipe. As the tube through which the water was poured was four feet high, it was ſuſpected that ſo much force had burſt the thin blood veſſels; but this was not the caſe, for in ſeveral trials, in which the force of the water was leſs than one foot of height, (a force inferior to that by which the blood is thrown into the lungs from the right ventricle,) the reſult was the ſame.

But though ſerum paſſes with this facility from the arterial capillaries into the air pipes of the lungs, and doubtleſs with greater eaſe after death than in a living ſubject, it was found that globules of red blood would not paſs through theſe exhalent mouths into the veſicles, though the force of a greater perpendicular height was made uſe of.*

After ſome conſiderations on preceding experiments, and more particularly thoſe which I have adduced, Dr. Hales infers, that ſome Aſthmas may ariſe from the effuſion into the veſicular cavities. He quotes Sir John Floyer, who entertained the theory of a "conſtriction of the bronchia, an effer-"veſcence of the blood, and a ſeparation of "the lympha lactea, which ſtopped in the "ſwelled glands of the lungs:" and our author ſuggeſts, that ſuch effects may be occaſioned by the defluxion of ſerum, of which he had pointed out the paſſage.

It is unneceſſary to confute the whole of Floyer's doctrine; and if part of it be true it is entirely hypotheſis.

Dr. Hales has given a fact of more importance than a thouſand ſpeculations, and his inference from experiment may be permitted to reſt within its natural limits. It would be unjuſt not to preſent his induction in his own words, and with this I ſhall cloſe the evidence which anatomical obſervation has appeared to me to preſent in ſupport of a theory of material irritation in Convulſive Aſthma.

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* Hales Statical Eſſays, Exper. XI. &c.

“ When we ſee,” ſays this philoſopher, “ how freely the ſerum paſſed from the pul-“ monary artery into the cavity of the veſi-“ cles and bronchia, ’tis no wonder that ſo “ great diſcharges of humors are often made “ through the ſame paſſages, when the “ blood is much diluted, by being in colds “ ſurcharged with too much obſtructed per-“ ſpirable matter, or otherwiſe diſordered: “ hence alſo ſome Aſthmas have their ori-“ gin.”*

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* Statical Eſſays, Vol. II. p. 88.

SECT. VIII.

Floyer, Hoffman, and Cullen, on Aſthma.—Remarks on Hoffman.—Deſcripton of the diſeaſe by Aretæus.—The capillary exhalents of the lungs unlike convoluted glands.—The uſe and indication of Convulſive Reſpiration.—The convulſions may remain after the irritation is removed.—The effect of frequent recurrence of Spaſm diſcovered by analogy of irritation ſituated in other organs.—Effect of irritation applied to different parts of the pulmonary ſyſtem.—Dr. Cullen's proximate cauſe conſidered.—Objections to his doctrine.—Spaſm muſt alternate with relaxation.—Diſſection gives no ſupport to the theory of Cullen.—The paroxyſm in the act of dying.—Relief from diſcharge of mucus.—The cauſe of wheezing.—Sir J. Floyer, evidence againſt himſelf.—The ſtraitneſs of the breaſt, and anxiety.—A perſon recovered from drowning preſents an explanation of wheezing in Aſthma.

THE writers of authority, who ſucceeded Willis, have involved themſelves in the obſcurity of their conjectural doctrines. If we are to believe theſe pathologiſts, the nerves have been implanted in the animal ſyſtem, to remind man of his misfortunes, and to betray the œconomy of life into perpetual derangement, and torments ſcarcely to be endured. The Convulſive Aſthma is not marked in their deſcriptions by any ſymptoms ſo ſignal as the *inviſible* conſtrictions of the bronchia, and the *effervefcences* of the blood.

Sir J. Floyer aſſures us, that "the "Periodic Aſthma depends on the conſtric"tion of the bronchia and bladders of the "lungs, by windy ſpirits:" a ſtate of the lungs which had never been proved, and which might therefore very properly have been neglected, till a well digeſted examination of conſpicuous appearances had been decidedly inadequate to explain the cauſe, or to afford indications of cure. It has, however, been ſhewn, that Sir J. Floyer did not omit to remark the extraordinary exceſs of contraction in the reſpiratory muſcles of the breaſt and abdomen; and thus far he obéyed the injunctions which he has given to ſucceeding phyſicians, "of deſcribing all ſenſible phænomena."

It will ſoon appear how difficult a taſk it is to avoid inconſiſtency, when this plain ground is deſerted, and the mind of the philoſopher, impatient of ſlow progreſs and careful induction, launches into hypotheſis.

The doctrines which have been eſtabliſhed by Floyer, Hoffman, and Cullen, on the proximate cauſe of Aſthma, are now accepted without much debate, as affording the eaſieſt ſolution of the curious ſymptoms of that diſeaſe; and if the practiſe in treating it had been ſucceſsful, it would be at leaſt uſeleſs, if not invidious, to condemn critically the principles on which it was purſued; we have, however, a confeſſion of the greateſt weight to excite the ſcepticiſm of practitioners. No inſtrument has yet been diſcovered, which, in the opinion of Dr. Cullen, can certainly remove Aſthma; and we may therefore rationally object, that the cauſe aſſigned by the Profeſſor is no uſeful direction to a cure, and may be even doubted in its exiſtence. I ſhall occaſionally obſerve the ſentiments of theſe writers, as the progreſs of the Inquiry may introduce the ſubject of their doctrines.

Hoffman, treating expreſſly only of the Spaſmodic, Flatulent, or Convulſive Aſthma, attributes this form of the diſeaſe to various extraneous cauſes.* He teſtifies to the preſence of œdematous feet in many inſtances. "Supervenit cachectica corporis defædatio, cum "tumore pedum œdematoſo, hydrops pectoris, vel etiam aſcites, ac anaſarca." When the blood oppreſſes the heart and pulmonary veſſels by its quantity or force, we have the Spaſmodic Sanguine Aſthma. When this condition falls upon hypochondriacs, whoſe primæ viæ are diſtended with flatus, the Spaſmodic Flatulent Aſthma appears. But, ſtrictly ſpeaking, the convulſive is without the preſence of a groſs material cauſe, depending only on a *ſpaſmodic conſtriction* of the reſpiratory muſcles, but chiefly the membranes inveſting the pulmonary cells. In purſuing the cauſe of this ſpaſmodic conſtriction, it is ſaid to be virulent and ſubtle matter falling on the nerves, from the repulſion of ſweats, of exanthemata, or the excretion of acrid lymph; from the retroceſſion of the gout or rheumatiſm. It is excited by metallic fumes, and the exhalations of aqua fortis, and by wounds of the diaphragm.

The ſame ſpecies of Aſthma ariſes from the receding of ſwellings in the feet of cachectic ſubjects;* for the ſerum which ſtagnated in the lower extremities is abſorbed and carried to the lungs, and occaſions extreme anxiety, difficulty of breathing, and ſometimes ſudden death.

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* Hoffman, Tom. III. Sect. II. Cap. 2.

The relation between œdema of the feet and Aſthma, is eſtabliſhed by repeated obſervations of Hoffman and others. When one diſappears, ſays Frederic Hoffman, the other is immediately excited, and vice verſa. "Notatu eſt digniſſima ſolutio Aſthmatis, "ac œdematis pedum, per diureſin copioſio-"rem, veluti diabeticam. Hæc omnino in "tali caſu pro critica habenda eſt," &c.†

And yet this writer takes the diſtinction which is ſtill preſerved of convulſive and humid, or pituitous; but the only evidence of a different diſeaſe which he exhibits, is in his conſultations, and there we find Caſe LXXXIV. called a Humid Aſthma; an examiner of the ſymptoms will, however, not find a particular reaſon for the refinement; for this Humid Aſthma is ſaid not to be confined to the breaſt. "Sed et in hypochon-"driis ſedem ſuam habens, ut adeo dyſpnœa

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* Hoffman, Tom. III. Sect. II. Cap. 2. §. XVI.

† De Aſthmate Obſervat. V. Epicriſis. 1,3.

" hypochondriaca ſimul jungatur, cujus ef-
" fectus in partes pectoris redundat, ob ner-
" vorum recurrentium cum negotio reſpira-
" tionis connexionem."

According to Hoffman, then, the Humid Aſthma and Spaſmodic Flatulent have cauſes in common producing both, the effects of which are ſo frequently the ſame, as to be ſubjected to no permanent rule of diſtinction.* This obſervation will be abundantly confirmed by reference to the caſes of Aſthma which he calls flatulent, ſpaſmodic flatulent, ſpaſmodic and convulſive, hypochondriac, &c. in all which the indications ariſe from *irritating cauſes*. A critical expectoration of mucus, the hydropic diatheſis, and dyſpepſia, very frequently occur in the ſame ſubject, but with no certain conſtancy.

Hoffman admires the deſcription of Aretæus with great reaſon, and even accepts it as his text in explaining the diſeaſe. This accurate writer did not omit to mark the expectoration of *frothy aqueous matter*; finally, in a fatal event, *ſuffocation*; in a fortunate one, *free and moiſt expectoration, with copious urine and watery ſtools.*[*]

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* Vide Tom. III. Sect. II. Cap. 2. § X. XI. necnon conſpiciendo Tom. IV. Conſultat. & Reſp. Med. Centur. I. Caſus LXXXIV. XC. XCI.

Aretæus informs us, that the diſeaſe terminates in ſuffocation generally, not often in recovery; and we may collect from this prognoſtic, how neceſſary it is to receive with diffidence the artificial diviſion which noſology has created in diſeaſes. It is extremely probable, that this obſerving Greek applied the phænomena of Aſthma where they would uniformly appear, in diſeaſes of great irritation and oppreſſion of the pulmonary organ; for the account before us muſt embrace many caſes of ſtronger influence on the actions of life than thoſe which the generic term of the preſent day can be made to comprehend.

Cælius Aurelianus preſents a feature, which we have copied, ſupporting the prognoſtic of Aretæus; and the caſe in Dr. Beddoes's Reports is additional confirmation of our pathology. It is highly probable that the Suffocative Catarrh appeared to the ancient phyſicians a form of Aſthma, becauſe in that affection the ſame ſenſible phænomena would appear, and pyrexia (not always preſent) would alone mark the difference.

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[*] Aretæus, Lib. III. Cap. 11.

Cullen has followed his predeceſſors in marking as a diagnoſtic ſymptom the afflux of ſerum to the lungs in the following words: "Cum ſputo muci ſæpe copioſo."

It is ſcarcely to be ſuppoſed that he was deficient in comprehenſive concluſions; and yet it is obvious, that mucus could not have been expectorated without a previous ſecretion of *ſerum*, of which he takes no notice.

If this ſeparation was eſtabliſhed, in what quantity had it taken place? The excretion was *copious*, and the effuſion muſt therefore have been very conſiderable.

What condition of the lungs admitted of a conſiderable effuſion of ſerum? It is known that the mucous glandules of the trachea and bronchia are ſubject to too great activity from cauſes inducing inflammation, and that in Catarrh an excretion of mucus is conſiderable from this condition of their veſſels; but is there pyrexia in Aſthma, or are there ſymptoms of local inflammation? Practitioners have generally teſtified, that ſuch a ſtate is abſent in Spaſmodic Aſthma.

Whence then this copious excretion of mucus? There are veſſels with exhalent orifices at the extremities of the air pipes, and theſe veſſels effuſe ſerum, as well as the glandules of the pipes themſelves; the conſtruction of theſe exhalents is not complex, as in the mucous glandules; they have not follicles in which they depoſit their lymph till it is excreted; but without a convolution of the capillary arteries, the finer fluid is directly poured into the veſiculæ. Having arrived at this ſource of mucus which is excreted, many reaſons may ſuggeſt themſelves for this being the principal, if not the only reſervoir, for the copious expectoration in Aſthma.

It is extremely unuſual to find Catarrh without fever; and the afflux of ſerum which oppreſſes the breaſts of old people, is moſt frequently attended with pyrexia, if the diſorder does not wear the form of Convulſive Aſthma in the periodic or continued exceſs of reſpiratory labour. There may be, therefore, an excretion from the mucous glandules, to furniſh part of the matter expectorated, but in conſideration of the abſence of pyrexia, it is improbable that this ſecretion can afford all the mucus which appears.

The capillary veſſels are conſidered by many phyſiologiſts as glands intended to ſecrete the mucus on the membranes of all the ſurfaces of the body; but in the effuſion from the pulmonary capillaries in Aſthma, there can be little elaborate preparation, becauſe the matter of heat, as in other inſtances of glandular ſeparation, is not given out neceſſarily in greater quantity, but from the condition of the habit in regular caſes in much leſs.

The capillaries are here paſſive, and yield to the impulſe of the arterial contents without any extraordinary action in general caſes, though not always, from the complication of cauſes where the diſeaſe is not ſettled in its ſimpleſt form; we muſt therefore conclude, that the quantity of fluid which oppreſſes the air cavities of the lungs in Aſthma, is the effect of a morbid ſtate of the capillaries, which in health exhale a thin vapour, but in their atonic ſtate effuſe a condenſed liquid.

With this explanation we may account for the preſence of ſo much accumulated ſerum in the veſiculæ of the lungs, where there are no convolutions of veſſels to be denominated glands, their office being ſupplied in a more ſimple manner by the arterial capillaries themſelves, which are liable, in Aſthma, to little or no inflammation, but to frequent torpor and quieſcence.* In this ſtate there is no active ſecretion, as in the caſe of glands, but the fluid is rather permitted to eſcape; the *vis a tergo* being equal to propel it, but the conſtitutional and inherent tone of the extreme veſſels being ſo inirritable as to be inſenſible of its ſtimulus in their capillary branches, and the area of the veſſels is therefore not contracted to ſuch a diameter as will detain the groſs part of the current. There is as little difficulty in aſſenting to the poſition of a torpor of theſe capillary extremities, as to their increaſed activity. In one caſe we muſt allow the principle of a power of contracting, independent of the trunks from which they proceed; and, in the other, a debility which does not proportionally correſpond with the tone of the larger veſſels. The latter ſtate is as conſiſtent with phyſiology as the former, and each may be reaſonably allowed to exiſt in different habits.

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* *Torpor* and *Quieſcence* appear to me properly expreſſive of the condition of a capillary veſſel, which is not irritated to contract by its contents; but I am not certain that my application of theſe terms correſponds with the meaning of the learned author of Zoonomia, who introduced them.

The exquiſite labour of reſpiration is conformable to animal laws under the oppreſſion of this fluid, notwithſtanding the inoffenſive quality of it, for the texture of the lungs will permit nothing to remain that is unneceſſary to the exerciſe of its functions, and the cavities being appropriated to the reception of air, immediately become ſenſible of the embaraſſment of the groſſer fluid.

Floyer is diſpoſed to deny in general convulſions in any of the expiratory or inſpiratory muſcles, yet he allows theſe * "Con-"vulſions or twitchings" upon extremities of labouring and ſuffocation; but his † deſcription of the contractions of the muſcles of reſpiration, during the paroxyſm, would ſufficiently ſhew their convulſive efforts, without this particular conceſſion.

Theſe inordinate motions may ſeem inadequate to the effect by counteracting the purpoſe of their excitement, but in the early condition of the complaint a quickneſs of reſpiration precedes the paroxyſm that by the encreaſed exerciſe of this function, and yet not violent, the expirations may carry off in vapour the ſerum in the cavities; the action of the abſorbents is quickened, it is probable,

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* Floyer, p. 50. † See his Treatiſe, p. 7.

in the ſame proportion, and by the united powers of theſe inſtruments, the balance is attempted to be reſtored between abſorption and exhalation. If they are equal to the taſk; nature makes no more efforts to obtain her purpoſe, and a certain ſtate which would ſoon be inconſiſtent with health, is altered by an unobſerved but active force of two combined powers. If this object is not accompliſhed on account of the continued prevalence of the prediſpoſing or exciting cauſes which prevent the returning contractile tone of the exhalent orifices, or if the lymphatics are unable to perform their ſhare of the work, the energy which has been deſcribed will certainly take place. It then may ſuffer ſuch an increaſe as to be itſelf a diſeaſe, even after the morbid irritation is removed, particularly when the frequent recurrence of the diſorder has induced upon the organ, the habit and force of aſſociated motions. "For," ſays Dr. Darwin,* "all the fibrous motions, whether "muſcular or ſenſual, which are frequently "brought into action together, either in com- "bined tribes, or in ſucceſſive trains, become "ſo connected by habit, that when one of "them is reproduced, the others have a ten-

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* Zoonomia, Vol. 1. Sect. x.

" dency to ſucceed or accompany it." This extraordinary energy is not deſtitute of intention and uſe, as doubtleſs it becomes an indication that an organ is irritated, and its functions diſturbed, and the paroxyſm will be repeated at intervals till this indication is anſwered efficaciouſly by the phyſician, or the powers of the ſyſtem are exhauſted in its efforts.

In the ſame manner Acrid Bile in the inteſtines occaſions extraordinary periſtaltic motion, and if that irritating material is not diſcharged from the bowels by the ordinary exerciſe of their powers, an inverted motion will ariſe, equally counteracting the means of relief, as does the violent action of the reſpiratory muſcles in Aſthma. Ileus is then produced, where leſs ſenſibility of injury, and leſs exertion to remove it, would have been anſwered by a reſtoration of regular diſcharge.

In menſtruation many delicate females undergo great agony before the uterine veſſels have unloaded themſelves, and the exceſs of convulſive effort which is exerted in this periodical effuſion muſt be often moderated by opium, before the excretion can proceed with ſucceſs. In parturition, the difficulty brings on ſimilar contractions, which the ſex can diſtinguiſh from thoſe pains which are uſeful to forward the birth. Here, too, opium, in proportion to the urgency of convulſive efforts is neceſſary to abate them, that nature may have the advantage of her own direct and unembarraſſed throes.

In teneſmus acrid feces are to be expelled from the rectum, but the convulſive actions of that bowel are extended and become more acute, embarraſſing the effect which would have been produced by more moderate motions.*

Irritation produces, in the pulmonary ſyſtem, effects different in quantity, and manner of exertion, according to the part of the organ on which it is impoſed. If a drop of the moſt limpid water falls into the larynx, it excites a more violent cough than the effuſed ſerum in the veſicles at the extremities of the wind-pipe. This ſhews the difference between a catarrhal cough and an aſthmatic one, the lymph accumulated in the veſicles is rather oppreſſive than acrimonious, and the ſenſibility of their membrane is leſs acute than that of any part of the bronchia, and ſtill more dull than the membrane of the trachea. There is therefore leſs of cough in the paroxyſm of Aſthma, both becauſe the veſicle is the chief ſeat of the diſorder, and the ſubſiding of the veſicle in expiration is rendered impoſſible by its cavity being occupied by diſtending lymph. This is the true cauſe of a paroxyſm of Aſthma commencing with little cough, and that ſeemingly impeded in its effort; after abſorption has leſſened the quantity of fluid, and reſpiration, though imperfect, has diſcharged ſome, the remainder is more controulable, and the internal elaſticity of the bronchia being reſtored anſwers progreſſively more perfectly to the ſtimulus exciting expectoration.

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* See Alex. Monro, ſen. on the Nerves, p. 276. Zoonomia, Vol. 1. ſect. XVII.

But though the internal activity of the lungs has been thus diminiſhed, the motions of the reſpiratory muſcles, which are nicely aſſociated with the ſenſations of the bronchial and veſicular linings, are induced to aſſume violent contractions, more energetic and convulſive, becauſe this internal action is ſuſpended and oppreſſed, and incapable of relieving the ſyſtem of air-pipes by the uſual means.

Profeſſor Cullen ſums up his patholgy on Aſthma, in the following words; "From

" the whole of the hiſtory of Aſthma now " delivered, I think it will readily appear, " that the proximate cauſe of this diſeaſe is " a preternatural, and in ſome meaſure a " ſpaſmodic conſtriction of the muſcular " fibres of the bronchia; which not only " prevents the dilatation of the bronchia " neceſſary to a free and full inſpiration, " but gives alſo a rigidity which prevents " a full and free expiration. This pre- " ternatural conſtriction, like many other " convulſive and ſpaſmodic affections, is rea- " dily excited by a turgeſcence of the blood, " or other cauſe of any unuſual fulneſs and " diſtention of the veſſels of the lungs."*

There are many difficulties to encounter in receiving this theory. But it cannot fail to ſtrike the medical inquirer in the firſt inſtance that the cauſe which it aſſigns is inconſiſtent with the doctrine inferred, if not advanced, in treating Dyſpnœa, a diſeaſe which compriſes many caſes of the continued ſpecies of Floyer. The experience of former writers had placed theſe caſes of difficult breathing under the head of Aſthma, nor can ſubſequent obſervation urge any objection to the term which is ſufficient to overturn their authority. The abſence of one ſymptom of the number which characterize the diſeaſe, is not an adequate reaſon, whilſt the remainder prevail with uninterrupted violence.

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* Cullen's Practice, MCCCLXXXIV.

It has appeared that the material giving irritation in the continued ſpecies, produced the ſame difficult reſpiration, as marks the diſorder in the periodic, but Cullen is ſatiſfied with paſſing Dyſpnœa in a ſuperficial manner, without attributing the affection to any cauſe but the extraneous ſubſtance which irritates the organ. He does not expreſſly ſay, the affection is owing to this proximate cauſe, but he infers that the cure of Dyſpnœa muſt proceed upon the indication of removing it, and it is clear from his deſcription of the ſpecies under that genus,* both in his noſology and practice, that there can be no probable ſucceſs expected from any other.

What then is become of the preternatural conſtriction in caſes where its interference is as neceſſary in explaining the ſymptoms, as in the Spaſmodic Aſthma? It will be replied, that the ſudden and periodical attack of the paroxyſm in the Spaſmodic Aſtma, is only to be accounted for by the ſpaſm of the bronchia in one kind, whilſt in the other, the cauſe is permanent and the ſymptoms are therefore continued. But conſtriction from ſpaſm is not neceſſary in explaining the invaſion or the intermiſſion of the ſymptoms in the Periodic Aſthma, as the intervals in which theſe ſymptoms are abſent, may be ſatisfactorily accounted for in greater conſiſtency with the ſimple rules of natural life, and with the phænomena of the other ſpecies; at the ſame time it is to be recollected that a perfect intermiſſion is not an eſſential diagnoſtic of this form of the diſeaſe.

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* Noſologia Methodica, G. LVI. Practice, MCCCLXV. MCCCLXXII.

On the contrary there will be the greateſt difficulty in aſſuming, that ſpaſm occaſions the ſymptoms of reſpiratory labour in the continued ſpecies; and this had probably been apprehended by Dr. Cullen, or he would not have paſſed the ſubject of Dyſpnœa with ſuch ſlight conſideration of the phænomena attending it. In this affection the ſtraitneſs of the cheſt is more or leſs conſiderable; the wheezing is not always preſent but frequently occurs; the expectoration is very uncertain, as, according to the extent and violence of the prediſpoſition, mucus may or may not conſtitute a portion of the irritating material.

We have, in fact, all the ſymptoms of Periodic Aſthma, in train of ſucceſſion, but not conſtantly together, prevailing in the ſpecies conſidered as ſymptomatic, though in the pathology of this, ſpaſm has not been mentioned. In the Periodic Aſthma, there is no certain and fixed time marked by the abſence of Dyſpnœa; for though this affection of reſpiration frequently ceaſes at the termination of a paroxyſm, when Aſthma wears its moſt diſtinct and ſimple form, yet very commonly a certain ſtraitneſs and uneaſineſs in the cheſt, which is the ſame ſtate of the lungs that in the paroxyſm has been attributed to ſpaſm of the bronchia, will continue, attended with expectoration, more or leſs copious, and ſome wheezing; ſtill we have Spaſmodic Aſthma, modified in its force, but rendering the condition attributed to the bronchia very improbable, becauſe ſpaſm cannot be expected to ſubſiſt without relaxation for a great length of time, in oppoſition to the force of remedies and the alternating order of muſcular contraction.

The author of Zoonomia ſays, "after "animal fibres have for ſome time been ex-"cited into contraction, a relaxation ſuc-"ceeds, even though the exciting cauſe "continues to act;"[*] a poſition which he elucidates with many important analogies, and which is ſupported by the authority of all experience.

Dr. Ryan[†] perceives this continued ſtate of the ſymptoms between the fits; but finding an obſtacle in accounting for it in the phyſiological truth, that ſpaſm muſt alternate with relaxation, he hazards a doubt of that principle, but not with ſuch reaſons as can ſuperſede the ſupport of experiment in its favour.

As applied to the affection of the bronchia, it is unneceſſary to introduce the objection, becauſe this may ariſe from cauſes more manifeſt to the ſenſes; and I quote his obſervation only in teſtimony of the fact, that there is not always an intermiſſion of the ſymptoms, though the paroxyſm may be periodic.

Dr. Withers[‡] finds the ſame ſtate of Dyſpnœa as Dr. Ryan, between the paroxyſms of Aſthma, which he explains very juſtly by the preſence of phlegm, or ſome material offence in the air veſicles of the lungs, which harraſſes the patient till it is diſcharged by coughing. This author has not, however, purſued the truth, though he ſaw the road to it; for he takes the diſtinction of Humoral and Convulſive Aſthma;* and according to him, it is only when they are joined that the Dyſpnœa continues between the paroxyſms: he therefore aſſents to a portion of the theory which I endeavour to advance. There is a Humoral Aſthma, when ſerum lies in the veſicles of the lungs, and produces extraordinary effort of reſpiration. We muſt wander in perpetual inconſiſtency, if, after finding the cauſe of certain exceſſive motions of the muſcles in one inſtance, we do not apply its principle to ſimilar motions in other affections of the ſame organ, though in theſe the material may be more ſubtle which embodies it, and the inveſtigation in proportion difficult.

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[*] Zoonomia, Vol. I. Sect. XII. I. 3.

[†] Obſervations, &c. Chap. I.

[‡] Treatiſe on the Aſthma, p. 10.

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* Is not every Humoral Aſthma convulſive? If the unfortunate patient has ſo little irritability as not to be excited to cough, (a convulſive action,) the phlegm muſt ſuffocate him, if the abſorbing veſſels do not carry off the load of mucus. But though the Humoral Aſthma muſt be convulſive, Convulſive Aſthma is not always humoral, for we ſhall ſee that irritation may ſubſiſt in a more ſubtle form than lymph.

Had the Profeſſor examined without the prepoſſeſſion of a certain theory, the ſtate of the veſicles in Aſthma, he would have found in the proſecution of his ſearch ſuch appearances,* as aided by the knowledge of prediſpoſing cauſes, and his obſervation of a predominant ſymptom would probably have led him to a proximate cauſe, as free from conjectural hypotheſis, as diſtinguiſhes his cauſe of Apoplexy. In that diſeaſe he has taken fixed and certain marks in the morbid alteration of the vaſcular ſtructure of the brain.

A ſimilar condition would have ſerved for the proximate cauſe of Aſthma, if tranſferred to the veſſels of the lungs, and would have better ſupported the conſiſtency of his deſcription of ſymptoms attended by "a co-"pious expectoration of mucus." If a ſpaſmodic conſtriction is a ſtate neceſſary to the pathology of the diſeaſe, it ſurely may be better defended as a ſymptom conſequent of the effuſion, than the effuſion can be ſupported as a ſymptom of the conſtriction.

But though circumſtances will not encourage the aſſumption of Spaſm of the bronchia as a part of the paroxyſm of Aſthma, it is not intended to deny poſitively this condition, ſince there are no premiſes of obſervation or experiment to furniſh authority of conviction, when diſcuſſed.

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* See Anatomical Obſervations in Sect. VII.

The lungs have little ſenſibility, and are ſupplied very inadequately with nerves. In Catarrh there is no mention of ſpaſm of the bronchia, though theſe air pipes are ſo frequently the ſeat of that affection. Is a ſtate to be aſſumed whenever the pathologiſt is embarraſſed, to ſee clearly the cauſe of the ſymptoms? If conjecture is thus admitted to take place in inquiries which ſhould be only proſecuted by attending to the index of natural appearances, and by purſuing the inductions which they afford, there can be little difficulty in erecting ſyſtems, whilſt imagination can lay a baſis, and a moderate knowledge of phyſiology prevent any groſs errors in the execution of the ſuperſtructure. In Phthiſis, the ſubſtance of the lungs has been almoſt wholly deſtroyed, but ſpaſm has not been called in, though the quality of the expectorated matter may be conceived to irritate the bronchia, when large maſſes in ſucceſſion are paſſed through their apertures; and though this diſeaſe, as well as Aſthma, induces occaſionally an exceſs of labour in reſpiration, when the oppreſſion of matter in the veſiculæ excites the muſcles to relieve the organ.

There is no ſupport given to the theory of ſpaſmodic conſtriction of the bronchia, by any anatomical obſervations with which I am acquainted.

Ruyſch has, indeed, three relations of diſſections, which may at firſt view create a doubt, but which cannot be admitted as any evidence of the exiſtence of ſpaſm, after the ſlighteſt conſideration.

Obſervation XIX. of this writer relates to a virgin ſubject, forty years of age, who died after ſuffering complicated diſeaſes, diſtinguiſhed by dropſy and orthopnœa. The abdomen was found to contain water, the peritonæum was thickened, the omentum ſchirrhous, the inteſtines contracted, the ſpermatic veins ſo dilated as to admit a writing pen with eaſe, &c. the lungs adhered to the pleura, the heart larger than uſual, and more water in the pericardium than common; the right kidney inverted. (Exhibited in a plate.) But in the lungs he points out the curious circumſtance of a collection of pellucid veſiculæ, expanded with air, and ſo obſtructed as not to be evacuated of this air by ſome degree of compreſſion; nor could he blow air into theſe veſiculæ, as there was no communication with their cavities from the trachea; but a violent impulſe ruptured ſome of them, &c.

The caſe was too complicated to be claſſed with inſtances of purely Spaſmodic Aſthma; and the obſtruction muſt have been occaſioned by inflammatory adheſions of the coats of the air pipes, as there was no ſort of aperture; and the adheſions of the pleura prove the pneumonic inflammation which had preceded death.

The two ſucceeding obſervations are hiſtories of ſimilar diſcoveries, in patients who had been affected with Dyſpnœa, and Ruyſch concludes, that ſuch a morbid ſtate muſt occur oftener than has been taken notice of by authors, from the difficulty of obtaining permiſſion to open bodies.*

Theſe inſtances belong to the claſs treated in the firſt part of the inquiry, as clearly as any caſes arranged by Floyer, under the continued ſpecies, or by Cullen, under the genus Dyſpnœa.

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* Vide Frederici Ruyſchii Opera, Tom. I. Obſerv. XIX. XX. XXI.

But whilſt the ſilence of authors is a negative teſtimony that this ſpaſmodic conſtriction of the bronchia has not at preſent been found in convulſive Aſthma, we have on the other ſide ſome affirmative ſupport of our confidence in the oppoſite condition.

Dr. Stark informs us of the ſtate of the lungs, in caſes of tubercle or vomica, which though not a part of the diſeaſe now under our conſideration, may be allowed to give an irritation ſufficient to account for ſpaſm, if the internal texture, and œconomy of the organ was ſuſceptible of this affection from cauſes inducing Aſthma. He ſays, The blood veſſels as they approach the vomicæ, are ſuddenly contracted; their cavities being obſtructed, as it appears by the endeavour to inject or blow through them.

The air veſicles contiguous to tubercles or vomicæ, are impervious to air, but as to the branches of the trachea, " *theſe are never found* " *in any degree contracted.* The internal ſur- " face of thoſe which opened into the large " vomicæ was of a deep red, (ſeemingly from

" the enlargement of veſſels) and the internal ſurface of the trachea itſelf, was partially " red."*

Dr. Cullen aſſigns a turgeſcence of the blood as the occaſion of ſpaſmodic conſtriction of the bronchia, but in vomicæ the veſſels ſhew marks of inflammation without any conſtriction of the air pipes following this condition of the blood veſſels.

Diſſection then has not elucidated the myſtery of ſpaſmodic conſtriction of the bronchia, but it will be replied, that the ſpaſm is relaxed before death, and thus eludes the examination of anatomy. It is, however, remarkable that this ſtate of conſtriction has not appeared in ſome inſtances after death, when an attendant diſeaſe of more rapid and fatal progreſs than the Aſthma, may have finiſhed a patient under the dominion of the paroxyſm of the latter.

But what is the pathological ſtate of a dying perſon, conquered by the force of any other diſeaſe, which has not by exhauſting the irritability of the ſyſtem, deprived the ſubject of all muſcular energy on the verge of his departure?

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* Dr. Stark's Works, p. 28, 29.

The ſame laborious action of the reſpiratory muſcles takes places in the laſt ſcene, though their power will be diminiſhed and their convulſions not ſo vigorous. The effort is here made to inſpire fully, that the blood ſtagnating in the pulmonary veſſels may be driven to the left ſide of the heart, and the laſt attempt of the function is that of inſpiration. The ſymptoms occur from neceſſity, becauſe through the weakneſs of the heart, and its irritability being diminiſhed, nature is unable to propel the blood through the lungs; its delay becomes an exciting cauſe of new exerciſe of reſpiration, that the organ may be freed from the oppreſſion. This energy is not equal to counteract the general debility, which at every pulſation is diſcovered to labour under encreaſed diſtreſs. Death cloſes the ſcene introduced by ſymptoms which juſtify the expreſſion of the philoſopher, "*that Aſthma is a contemplation on death.*"

As the act of dying is ſo very generally attended with muſcular efforts ſimilar to the paroxyſm of Aſthma, and yet no appearance of ſpaſmodic conſtriction of the bronchia has been diſcovered by diſſection, it is fair to conclude that it was not a part of the laſt condition of the lungs.

In Aſthma the paroxyſm is the natural effort of the ſyſtem to inflate the veſicles of the lungs againſt the impediment of a cauſe mechanically filling their cavities. And in dying it is the laſt energy to obtain the ſame effect in oppoſition to the accumulated blood, which, from the encreaſed debility of the heart, cannot be propelled through the pulmonary veſſels.

In both an obſtructing fluid irritates the organ to its exertions. In Aſthma, the obſtruction is temporary, and the ſymptoms diſappear with the irritation; in the paroxyſm of dying the oppreſſion grows ſtronger as the ſtrength of the heart, and the irritability of the ſyſtem becomes leſs able to conquer it.

As there is no denial of the exceſſive action of the reſpiratory muſcles excited by the diſtreſs of the pulmonary ſyſtem, it is matter of great ſurprize that it ſhould not have been more particularly noticed by writers, and a ſuppoſed ſpaſm refuſing admiſſion of air into the bronchia, pointed out with diſtinction as a proximate cauſe. Cullen could remark that a remiſſion of the fit "becomes immediately more conſiderable, if "the cough brings up ſome mucus, and that "a much wiſhed for ſleep ſucceeds," and not be ſtruck with this critical effect of partial expectoration.

Every man who has ſuſtained the paroxyſm is convinced that ſomething is to be diſcharged from the lungs: a ſpaſmodic conſtriction of the bronchia he is not certain of, nor can the moſt acute phyſiologiſt aſcertain ſuch a condition. The exertion of the muſcles indeed are noticed to be laborious, and calculated to operate a great effect. Their action may be ſeen and felt, and it is very poſſible that the influence which excites it may be extended by the branches of the par vagum over the ramifications of the bronchia; this influence and its extenſion are directed to the ſame object, but the extenſion is not ſeen, and can only from analogy be ſuppoſed, and even then with ſome embarraſſment from phyſiology, which never deviates from repreſenting the internal ſtructure of the lungs as little irritable and ſcantily ſupplied with nerves.*

All the phænomena of the paroxyſm may be accounted for from the neceſſity of pumping up or expectorating lymph, which being too copious to be duly carried off by the abſorbents, and the act of expiration, ſtagnates in the veſicles and bronchia.

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* Vide Haller Element. Phyſiolog.

In expiration, the air ſhould be expelled from the lungs, carrying with it the fluid lymph in form of vapour; inſpiration ſhould therefore bring air to the extreme internal ſurface of the veſicles. If air has not arrived at the bottom of the veſicles, the lymph contained in them will not intervene between the ſource of the current and its iſſue; it is therefore an attempt of relief that is exerciſed in the act of inſpiration, as well as expiration, but difficulty accompanies the operation, becauſe theſe veſicles have their cavities filled with lymph, which is the cauſe to be removed.

The bronchia alſo, whoſe internal membrane is intended to effuſe a lubricating moiſture only, ſubmit to the condition which prevails in the veſiculæ, and the paſſage of the air through theſe pipes is much narrowed, though not cloſed up; hence *wheezing*, both in inſpiration and expiration.

A ſpaſmodic conſtriction of the bronchia has not only been conſidered as the proximate cauſe of the diſeaſe, but as peculiarly inducing the wheezing, which is remarked ſo generally in reſpiration: if this be the caſe, we may fairly expect to remove this diagnoſtic ſymptom by the uſual antiſpaſmodic medicines, and more particularly by the exhibition of opium; it will, however, be ſeen, that a large doſe of opium merely abates the too great efforts of the reſpiratory muſcles, and leaves this peculiar proof of ſpaſmodic conſtriction where it was. There has been no experience of the air having been inſpired or expired without wheezing, in conſequence of antiſpaſmodic remedies; nor did the paroxyſm remit, or the diſeaſe terminate, without expectoration. The effect of the opium ſhews itſelf upon the nervous ſyſtem generally, and not in particular application, by the removal of local ſpaſm. In ſpaſmodic contractions of any particular muſcle, opium diſcovers a ſpecific efficacy when given in a proper doſe; the ſpaſm will relax, and no bad effects reſult from the remedy to the functions of the ſyſtem. In Aſthma, on the contrary, opium will indeed blunt ſenſation and uneaſineſs, and the contractions of the external reſpiratory muſcles will be leſs violent, but the diſorder proceeds to its uſual termination, and the phyſician muſt be convinced, that the drug imparted no ſpecific virtue to ſuſpend a local diſeaſe, becauſe the patient will have its whole power to contend with, in addition to the inconvenience it was intended to remove.

Floyer* remarks, " that the bronchia " are contracted or ſtraitened, which pro" duces the wheezing noiſe in expiration :" and afterwards proceeds to ſay, " that this " ſymptom does not depend on phlegm, is " plain, becauſe the hyſteric, who have no " phlegm, wheeze very much." But Floyer had not the full advantage of an expanded knowledge of the abſorbent lymphatics, or he would poſſibly have ſeen a mode of removing extraneous fluid by their operation in this inſtance of Hyſteric Aſthma ; for when wheezing appears in that form of diſeaſe, in which ſpitting does not terminate the fit, it is highly probable, that abſorption has been exerted to the full effect of removing the lymph, which had really been effuſed in the hyſteric, as well as the ſpecies we are now treating; and, independent of this conſideration, there are other cauſes mechanically compreſſing the trachea, ſufficient to account for wheezing when it really takes place in the Hyſteric Aſthma.

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* Floyer, p. 43.

Notwithſtanding the above obſervation of Floyer, an attention to his own feelings produces, in another place, a declaration which points out a ſenſe of the ſtricteſt connection between the cauſe of his diſeaſe, and the ſpitting which accompanies it. He ſays, "all the lobes of the lungs are not "conſtringed alike: for, in the fit, I could "never breathe tolerably if I lay or leaned "on the left ſide, which made me very "ſenſible, that all my ſtraitneſs lay on the "right ſide of my lungs, and that inclined, "or naturally occaſioned me to lie on that "ſide during the fit; but after the fit was "over, I always lay eaſieſt on the left ſide. "I perceive the right ſide to be moſt af-"fected in my caſe, and from thence all "the ſpit does plainly riſe when the fit "goes off."* Conſidering the diſtention of the ſtomach from flatus, it may be caſually obſerved, that it is extraordinary Floyer did not attribute his uneaſineſs in lying on his left ſide, to the preſſure of that viſcus againſt the diaphragm, but, it ſurely is very remarkable, that having aſcertained, by his reaſon and his feelings, that the diſeaſe lay particularly in one lobe, and that ſpitting evacuated the veſicles of that lobe, when the diſeaſe left it, the other ſide being comparatively free from complaint, he ſhould not have preferred uniting cauſe and effect from plain evidence of their relation, and neglected a theory of conſtriction which had never been proved.

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* Floyer, p. 8.

In another place he ſays, " that * in the " Humid Aſthma the lungs do not appear " to be much oppreſſed with phlegm before " the fit, and at the end of the fit the ſtrait- " neſs goes off, before any conſiderable quan- " tity of phlegm is ſpit up, which would " not happen if the ſtraitneſs depended on " a great quantity of phlegm."

The *ſtraitneſs* cannot be accounted for by the pathology of Floyer, but we ſee the implied fact of a ſtrict coincidence of this affection, and an accumulation of phlegm. This ſtraitneſs is a ſenſation not readily to be defined, but it reſults from the ſame general condition of the pulmonary ſyſtem as induces the other phænomena; more particularly it ariſes from the diminiſhed ſum of the cavities, which ſhould admit air in inſpiration. The veſiculæ are occupied by lymph, the bronchia are ſtraitened in their area by the ſame cauſe, in a more viſcid ſtate, the diaphragm cannot deſcend as it uſed to do, on account of the reſiſtance of the ſtomach, filled and diſtended with flatus, and the trachea is probably narrowed by the compreſſion of the œſophagus, affected like the ſtomach; it is in this condition that the external reſpiratory muſcles endeavour to dilate the thorax, by lifting up the ribs and ſternum, which evidently cannot accompliſh the object of filling the air cavities, which are obſtructed, or of forcing down the diaphragm, whoſe own contractions had been inadequate to oppoſe the reſiſtance of the ſtomach; a *ſtraitneſs* is then felt from theſe obſtacles to a capacious inſpiration, and not merely from the preſence of phlegm.

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* Floyer, p. 7.

But phlegm could not be expectorated at all, if it had not been effuſed in the fluid ſtate of lymph, in which ſtate it becomes oppreſſive to the pulmonary organ, and excites a niſus to remove it. The inſpiſſated form in which it is firſt expectorated proves the neceſſity of ſome delay in the veſiculæ and bronchia, to render it thick; and though the ſtraitneſs goes off before any conſiderable quantity is ſpit up, the patient enjoys immediate relief from a ſmall excretion. But the *ſtraitneſs* proceeds from the concurrence of the above cauſes, and will be relieved, as any one of them is induced to ſubmit. The *wheezing* depends only on the diminiſhed capacity of the air pipes, and continues generally through the diſeaſe, progreſſively becoming leſs, till the ſecretion of mucus in the bronchia is reduced to regular quantity, and the diſtended ſtate of the œſophagus no longer compreſſes the trachea, when it ceaſes.

It appears, then, that notwithſtanding the remark of Floyer, the ſtraitneſs of the breaſt muſt be materially connected with the internal ſtate of the lungs. There muſt be a point of time when the ſilent activity of the abſorbents has effected ſome change in the quantity of ſerum accumulated in the air cells and bronchia, and there muſt be a degree of oppreſſion from the influence of this ſerum, which being taken off at that time, will permit the return of ſome elaſtic action in the bronchial rings and veſicular membranes; relief will therefore be perceived in the breaſt before excretion of phlegm takes place, but not before the mucus has been reduced, by abſorption, to a quantity which the internal elaſtic force of the veſiculæ and bronchia can in ſome meaſure controul. Expectoration then partially proceeds, with that indeſcribable ſenſation of eaſe and ſatisfaction, which the patient will not heſitate to welcome as critical.

An accurate obſerver of affections of the breaſt, ſupports this opinion of the cauſe of wheezing: "That peculiar noiſe," ſays Dr. White, "in breathing, which we term "*wheezing*, ariſes commonly from the "branches of the trachea being ſtuffed up "by mucus or pus."* This ſound in Phthiſis has thus been attributed to its natural cauſe, becauſe the weight of authority had not biaſſed the obſerver to impute it to Spaſm. But wheezing in Aſthma is the ſame ſound as is heard in Phthiſis, and there is ſufficient evidence of the occaſional ſtate of either diſeaſe being an adequate cauſe of that ſymptom.

To confirm this explanation it has been proved, that ſuch an affection abſolutely accompanies the condition of a perſon reſuming his functions after ſuſpended animation from drowning, when water had been received into the lungs. Dr. Goodwin informs us, that when the functions return, " a difficult " and ſtertorous reſpiration is obſerved. " This inconvenience ariſes from ſome wa- " ter ſtill remaining in the lungs, which " will be gradually evaporated by the ex- " pired air."*

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* Obſervat. on Phthiſis Pulmonalis, by W. White, M. D.

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* Goodwin on Animal Life and Reſpiration, p. 118.

SECT. IX.

Aſthma compared with other diſeaſes, bearing analogy in their cauſes. — Catarrh. — Phthiſis. — Aſthma, Lethargy, and Apoplexy, following intermittents and pneumonic inflammation. — The intercurrence of theſe affections. — Aſthma is a temporary Dropſy, diſtinct from hydrothorax and anaſarca of the lungs. — Aſthma, Dropſy, and Inſanity.

THE ſigns of an Aſthma are ſo ſtrongly marked, that there can be no difficulty in acknowledging the diſeaſe to any perſon, who has once obſerved it; yet it will elucidate the ſubject, to ſhew its diſtinction from ſome other diſeaſes to which it may bear an analogy, more or leſs conſpicuous in its cauſes and effects.

Defluxions on the upper part of the lungs and Sneiderian membrane, have been diſplayed as follows:

> "*Si fluit ad pectus dicatur rheuma Catarrhus:*
> "*Ad fauces Branchus, ad Nares eſto Coryza.*"

Theſe are uſually inflammatory affections, in which there is too great a ſecretion from the mucous glands which line the paſſages of the noſe, fauces, and trachea, as far as its diviſions, and poſſibly lower in the breaſt, but not extending to the extremities of the air pipes.

Catarrh evidently is the effect of a more elaborate ſecretion of mucus than can take place in the veſiculæ, and the ſecretion is attended with the evolution of heat. The diſeaſe ariſes from perſpirable matter, ſuppreſſed on the ſurface of the body, and determined to this membrane, or more probably from a torpor of the membrane itſelf, ſucceeded by increaſed action of its veſſels; for Catarrh is attended by pyrexia, excepting in peculiar inſtances, when the habit is more prone to ſpaſmodic muſcular contraction, and theſe have been adverted to.* The lymph is depoſited in cells, where it thickens, from abſorption of its thinner parts, and is ready to be excreted when thoſe cells are full. The acrimony of the diſcharge ariſes from the diſeaſed action in theſe ſecreting glands. The capillary veſſels which open into the veſiculæ, are not convoluted in the manner of glands, and exhale their fluid without appropriate cells to depoſit it in; their diſeaſe is that of too little contractile tone, and their apertures are diſtended by the force behind, without fever, or the evolution of heat.

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* See Caſes of Diſſection, Suffocative Catarrh, &c. Sect. VII.

The catarrhal diſpoſition is very frequently followed by Aſthma, becauſe from accidental cauſes a determination may be made to the lungs and mucous membrane, and the repeated inflammation of the capillary veſſels and the mucous excretories, will at length induce in ſome habits a debility of tone on thoſe minute orifices, which, when the phlogiſtic diatheſis of the ſyſtem is loſt, will prevent their reſiſtance to a circulatory impulſe even leſs than healthy, and ſubject them to the impreſſion of exciting cauſes of little force in compariſon with what they formerly ſubmitted to. For this reaſon elderly perſons have their natural excretion of mucus very frequently much more copious, as they may have been more affected by catarrh, and they are according to the extenſion and degree of this affection more liable to Humoral Aſthma. If inflammatory diſpoſition is not wholly loſt in theſe perſons by the progreſſive debility of the veſſels of the lungs, Peripneumonia

Notha will be the character of their pulmonary diſeaſe, attended often with great danger.

It therefore appears that catarrhal defluxions bear an analogy to Aſthma, by falling on the bronchia and wind-pipe, or the Sneiderian membrane, but in Convulſive Aſthma the effuſion is lower in the pulmonary organ, affecting the veſicles at the extremities of the air pipes. In Catarrh inflammation attends more or leſs according to the ſtate of the prediſpoſing habit, but in Aſthma pyrexia does not prevail, nor is the habit affected with vaſcular inflammation. In both diſeaſes there is, however, an effuſion of ſerum, and an irritation to eject it, but the conſtruction of the pulmonary organ and the circumſtances which have been explained, induces the action of different muſcles to accompliſh the purpoſe, and a different proportion of energy in the execution.

It is alſo conſiſtent with the rules of the animal œconomy, that Catarrh ſhould not be indicated by thoſe violent contractions of the muſcles of reſpiration which take place in Convulſive Aſthma. Fever is the ſyſtem of morbid actions, which in Catarrh, as well as Phthiſis, is adopted by nature to relieve the body of theſe affections; and we may obſerve, though we may not comprehend the fact, that fever generally ſuperſedes convulſive motions, and terminates their extreme energy; and that during the violent continuance of theſe motions, fever does not commonly appear.

If Catarrh occaſionally leads to Aſthma, it ſtill oftener brings on *Phthiſis*, a diſeaſe which depends on the ſtate of the lungs, manifeſtly the reverſe of that which permits ſerous effuſion.

In Aſthma, an exceſs of blood in the pulmonary veſſels may very probably precede the exhalation of the finer part into the veſiculæ and bronchia; this plethora ariſing from the relaxed texture of the coats of the veſſels, which yield to the *vis a tergo*, occaſionally more forcible than common, relieves itſelf by effuſion; the veſſels are, therefore, paſſive, and blood-letting is never, to my knowledge, uſeful, but frequently injurious.

In *Phthiſis* the arterial impulſe is more conſiderable than in health, but the prediſpoſition of the pulmonary veſſels is not favourable to a relief by exhalation, till the fever has acquired ſtrength, and coagulable lymph inſtead of pellucid ſerum comes to be effuſed. At this period the exhalent orifices are themſelves inflamed, and ſuffer an adheſion of their ſides, which prevents the tranſmiſſion of the finer fluid. Whether in the mouths of theſe arterial exhalents the obſtructing lymph does then become tubercles, as is the opinion of a judicious writer,* is of little importance to our inquiry; it is certain, that in this febrile diſeaſe of the pulmonary veſſels, coagulable lymph does exiſt, and its viſcidity is well calculated to ſeal up the orifices by inflammatory adheſion. If in this condition of the veſſels the impulſe of the blood is not diminiſhed by bleeding, but increaſed by occaſional cauſes, the conſequence will be rupture of the arteries for want of that depletion which would have unloaded them by diſcharge of ſerum. In Aſthma, on the contrary, whatever may be the exciting cauſes of extraordinary impulſe in the arteries, which will be conſidered hereafter, the contractile tone of their extremities is ſo diminiſhed, as not to reſiſt the force.

It is therefore to be allowed, that there is a prediſpoſition of habit, in which inflammation will affect the arterial extremities, and produce Phthiſis, as doubtleſs there is a prediſpoſition by which the habit will be ſubject to that atonic ſtate of the vaſcular pulmonary ſyſtem producing Aſthma.

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* Vide Reid's Eſſay on the Phthiſis Pulmonalis.

There may be alſo an intermediate ſtate, in which a balance is preſerved between the criſis of inflammation ſealing up the orifices of the arterial exhalents, and the diſtention of thoſe exhalents ſo gradually acquired as to permit the eſcape of the finer fluid, and conſequent relief of arterial fulneſs: but it is probable that this balance cannot be long adjuſted where the prediſpoſing cauſes have had a conſiderable influence, and that if the exhalents do not dilate ſoon in conſumptive habits, Phthiſis muſt take place; and in perſons of an oppoſite conſtitution, which I conceive is favourable to Aſthma, the effuſion of lymph into the veſiculæ and bronchia will determine, in no long time, the future character of the pulmonary diſeaſe.

Lethargic affections have been conſiderably allied to pulmonary complaints in the conſideration of many authors; ſo much ſo, as to create a queſtion if the cauſe of lethargy did not exiſt in the lungs.

Hyppocrates ſays, "*lethargic diſeaſes "are the ſame as peripneumonic, and not "altogether different from the humid peripneumony." (Peripneumonia Notha.) Some of his commentators have defended this opinion by the practical remark, that lethargy is critically relieved by expectoration of purulent or ſerous fluid; and others have even contended, that the Father of medicine intended, by the word ληθαργος, to ſignify a diſeaſe of the breaſt inſtead of the head. Willis endeavours to reconcile theſe opinions by the following explanation: "the "morbific matter is often in the firſt inſtance "ſeated in the head, and creates a lethargy; "it is then abſorbed, and carried to the "breaſt, producing empyema, or ſpitting of "pus like fluid."†

The lethargic ſymptoms in Aſthma and Peripneumony are ſufficiently accounted for by the interruption to the courſe of the blood from the right ſide of the heart to the left, giving diſtention, and obſtructing the influx from the veins, returning blood from the head.

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* Lib. II. et Lib. II. de morbis.

† Tractat. de Anima Brutorum, p. 2, C. 3.

There are certainly ſtriking circumſtances of analogy between Aſthma and *Apoplexy*, though theſe affections take poſſeſſion of different cavities, and practitioners have generally remarked that the ſame condition of habit is prediſponent to both diſeaſes. Profeſſor Cullen has aſſigned two ſtates of the veſſels of the brain as a proximate cauſe of apoplexy, and theſe ſtates applied to the veſſels of the lungs will be found to induce Aſthma.

" The blood accumulated in the veſſels " of the brain and diſtending them, and " fluids effuſed in different parts of the brain " or into the cavity of the cranium, and accumulated in ſuch quantity as to occaſion " compreſſion,"* are the proximate cauſe of Apoplexy.

In tracing further back theſe cauſes of compreſſion of the brain, the analogy continues and is apparently ſtrengthened. He finds them produced by any cauſe " increaſing the afflux " and impetus of blood in the arteries of the " head :"† by cauſes preventing the free return of the venous blood from the veſſels of the head to the right ventricle of the heart :‡ by whatever occaſions a difficulty in the tranſmiſſion of blood through the lungs:* by an effuſion of ſerum which may occur from a relaxation of exhalents as in other caſes of hydropic diatheſis prevailing in the body, and from an over proportion of watery parts in the maſs of blood.† Theſe remote cauſes by diſtending the veſſels of the head, by producing a morbid effuſion of ſerum, or by both, occaſion apoplexy, and by the ſame intervening means they cauſe Aſthma in the lungs.

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* Cullen's Practice. MCIII. † Cullen, MCV.

‡ Ibid, MCVI.

Aſthma frequently terminates in apoplexy, as was obſerved by Floyer, and other phyſicians, and ſuch an event is rendered very probable from conſidering the remote cauſes of each diſeaſe, as they are above enumerated.

Aſthma is ſometimes introduced into the habit by *intermittents*, which I believe are attended with *pneumonic inflammation.* It is obvious that this inflamed condition of the lungs may leave the veſſels relaxed and dilatable with ſlight impulſe to excite effuſion; and from this indirect debility an hydropic effuſion frequently takes place, progreſſively from a local diſeaſe becoming a diatheſis, which may occaſion apoplexy, or the delirium, or inſanity, which depends on compreſſion from effuſed fluid in the brain.

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* Cullen, MCVIII. † Ibid, MCXII.

We have an example in Floyer, ſhewing the connection of all theſe affections. *He remembered an apothecary who after he had been cured of an inflammation of the lungs by the uſual evacuatory means, ſuffered returns of the Aſthma, which had accompanied the fever every night, for a long time, with large ſpitting. Floyer attributes this ſtate to a deficient uſe of the cortex. Practical obſervation had ſuggeſted to him the truth that inflammatory ſymptoms being entirely removed, the periodic returns of the Aſthma ſhould have been oppoſed by the remedies of an intermittent, which are tonic, and would gradually have reſtored the contractile power of the capillary exhalents, which had been weakened more than in equal proportion to the reſt of the ſyſtem, and remained affected with atony longer than any other. The evacuatory plan had alſo been purſued with ſuch vigour, particularly in blood letting, as would probably leave the veſſels unuſually empty, and without the neceſſary ſtimulus of diſtention to excite their contraction. The event of the caſe exhibited very clearly the

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* Floyer's Treatiſe, p. 33.

analogy between pulmonary effuſion, and the effuſion from the veſſels of the head; "for the fever evidently returning on the "change of the year, ſeized his head with "delirium and convulſions, and killed "him." The diſeaſe thus diſcovered its identity, whether it affected the lungs or the head, and would probably have ſubmitted to a temperate plan of local depletion and general corroboratives, if all inflammatory ſymptoms had really been conquered with the fever. In confirmation of ſuch identity of cauſe, Floyer's evidence may be again called, if evidence, where univerſal medical experience and reflection muſt ſupport the opinion, ſhould be ſtill wanted. He remarks, that this ſtop or affection on the veſſels in old Aſthmatics, produces dropſy in the head, of which they always die lethargic.*

Aſthma being occaſioned by effuſion of ſerum in the veſiculæ and bronchia, is truly an *Hydropic Diſeaſe* whilſt it continues; but it is entirely diſtinct from Hydrothorax. In the latter, the ſerum is collected in the cavities of the thorax, that is, in both ſacs of the pleura; ſometimes, only in that cellular texture of the lungs which ſurrounds the bronchia and veſiculæ, and then more properly called anaſarca of the lungs. In each ſituation the fluid may be the cauſe of difficulty of breathing, but more particularly when it is ſeated in the cellular texture; but this dyſpnœa will be of the continued kind, and though ſubject to exacerbations from accidental exciting cauſes, will not put on the form of the Periodic Aſthma, or be diſtinguiſhed by the peculiar ſymptoms, which, in compliance with noſology, and the authority of Dr. Cullen, phyſicians do now concur in diſtinguiſhing by the name of Spaſmodic Aſthma.

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* Floyer, p. 47.

The compreſſion from ſerous fluid in the ſacs of the pleura, or cellular texture of the lungs, will be entirely external in its relation to the air cavities of the lungs, and muſt affect them by diminiſhing their area by compreſſion of their ſides. In Aſthma the air cavities are invaded by the entrance of an unuſual fluid, which cannot be long ſubmitted to with ſafety of life, as depending on the function of reſpiration: the agony is therefore in proportion to the importance of the object in excreting the fluid; and fortunately there is a direct outlet for the extraneous matter, if the diſeaſe has been too formidable for the power of abſorption and natural reſpiration to remove. The neceſſity, therefore, of thoſe active remedies which are given with ſucceſs in Hydrothorax and Anaſarca, is ſuperſeded in the caſe of hydropic effuſion of Aſthma.

Dr. Withering,* ſpeaking of Hydrothorax, ſays, it is very univerſally cured by digitalis.

Unprejudiced minds muſt generally aſſent to the extraordinary efficacy of digitalis in this ſpecies of Dropſy; and medical ſcience will acknowledge the clear and candid deſcription of its effects in multiplied caſes, by that judicious phyſician. The digitalis will not, however, cure the Aſthma when it wears the form of local diſeaſe only, and the habit is not pervaded by the hydropic diatheſis. The power of this herb has, notwithſtanding, been ſo confirmed in caſes of general Dropſy, that its inefficacy in Aſthma may be ſuppoſed to afford ſome teſtimony of ſerous effuſion not being the cauſe. But digitalis will not cure the Hydrocephalus, nor Hydrocele, nor any encyſted Dropſy, any more than it will that of the air cavities of the lungs.

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* Withering's Account of the Fox-glove, &c. p. 200.

But though the particular circumſtances of the organ diſeaſed do not favour the action of ſome of the moſt powerful remedies of Dropſy, and though the condition of the vaſcular ſyſtem of the lungs renders their interference unneceſſary and prejudicial, yet there is conſiderable weight of evidence, that Aſthma is an hydropic effuſion. Preſumption of this may be deduced from a conſideration of the prediſpoſing cauſes, which appear to produce ſerous effuſion in other cavities, followed by Apoplexy, and from a reference to cauſes peculiarly leading to general Dropſy, which will alſo be found to be the prediſpoſing and exciting cauſes of Aſthma.

We have alſo a teſtimony of the cloſe connection of the two diſeaſes in the hiſtories of practical authors, inceſſantly pointing out the intercurrence of ſymptoms and reciprocal changes of one diſeaſe into the other, when Aſthma has been of long ſtanding: ſome proof of theſe aſſertions is contained in Sect. VII. of this Inquiry.

Hoffman and Willis have particularly noticed the hydropic appearances of the feet, and the tendency to general dropſy in Aſthma: and the obſervation of theſe authors is ſupported by that of other practitioners.

Sydenham opens his treatiſe of the Dropſy by ſtating the firſt ſymptom of that diſorder, which he ſays is the ſwelling of the legs, and pitting of the ancle by preſſure of the finger: but this is not ſo certain a ſign in women as in men, nor even in the latter is it to be conſidered as an abſolute certainty of the diſeaſe having commenced. He then proceeds with the following remarkable obſervation.

"Etenim cum ſenex quiſpiam, habitu "corporis paulo pleniori præditus, *Aſthmate* "jam a multis annis laborans, ab eodem "derepente, idque hyemis tempore, fuerit "liberatus, mox ingens tumor muſculos tibiarum occupabit, Hydropicorum tumores "æmulans, qui hyeme etiam magis quam "æſtate, tempeſtate magis pluviâ quam "ſerenâ, pariter invaleſcit, et tamen ſine "quovis incommodo inſigniori, eundem ad "libitinam uſque comitabitur. Quo non "obſtante, ſi generaliter loquamur, ſuræ et "tibiæ intumeſcentes, etiam in viris, pro

" ſigno ſupervenientis hydropis habendæ " ſunt; maxime ſi ita affecti ſpiritum ægrius " ducant."*

This ſagacious obſerver might have attributed the ſwelling of the legs, with great truth, to hydropic effuſion in the Aſthmatic, as well as in other caſes; and the ceſſation of the Aſthma when theſe ſwellings commenced, ſeems to corroborate, beyond diſpute, the theory, that both affections depended on one cauſe. The ſwelling was larger in winter than in ſummer, in moiſt weather than in dry. Alterations in the atmoſphere rapidly affect the Aſthmatic, and change his habit from a perſpiring to an imbibing ſtate, and whether the aqueous accumulation ſtagnate in the air veſicles of the lungs, or be taken up by the activity of the abſorbents, as faſt as it is effuſed, and be again exhaled in the lower extremities, where the power of the lymphatics is not ſo ſucceſsful, the identity of the cauſe is ſufficiently plain.

Above two hundred caſes are delivered by Dr. Withering, and in this collection at leaſt twenty-eight are mixed caſes, in which

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* Sydenham Opera Tractatus de Hydrope.

Aſthma is a concomitant ſymptom of Dropſy. The author obſerves, "that the true Spaſ-"modic Aſthma, a rare diſeaſe, is not re-"lieved by digitalis:" and in his caſes two or three are denominated, true Spaſmodic, in which the treatment had no ſucceſs; in others, the patients were gibbous, preſenting a mechanical obſtacle to eaſy reſpiration, and a cure of the Aſthma: in the remainder, the Aſthma conſtituted a part of the hydropic diatheſis of the ſyſtem, and was relieved with the general diſeaſe. The Caſes XXIV. and XXXIV. deſerve particular attention. In the xxivth, the patient ſufferred alternately under Aſthma and Inſanity; and Dr. Withering attributed both ſtates of the diſeaſe to one cauſe, which was water. The treatment founded on this opinion was ſucceſsful in curing both. In the xxxivth Caſe, the patient ſuſtained Anaſarca and Inſanity at the ſame time, and was cured of both by the ſame means. It is impoſſible not to infer, that effuſion of water occaſioned all the ſymptoms in each patient, and that Aſthma, Inſanity, and Dropſy, had the ſame cauſe; for if Inſanity and Aſthma were one diſeaſe, and Inſanity and Dropſy were one diſeaſe, *Aſthma* and *Dropſy* muſt be one diſeaſe.

This tranſlation of ſymptoms from one organ to another has been treated under different names by ſeveral authors, but more particularly by Dr. Ferriar, who, after Baglivi, entitles the alteration of appearances, *Converſion of diſeaſes*; but the identity of cauſe, if not always, is very generally to be traced through the Proteus forms of the effect.

In pulmonary affections, Inſanity frequently ſuſpends Conſumption, and Conſumption Inſanity: Aſthma, likewiſe, is ſucceeded occaſionally by Inſanity, even when the hydropic diatheſis is not eſtabliſhed in this inſtance there may be an effuſion of ſerum from the veſſels of the brain, but without this effuſion the turgid ſtate of theſe veſſels, from the difficulty with which the right ſide of the heart propels the blood through the lungs to the left, is ſufficient to account for the ſymptoms of inſanity. In the hydropic diatheſis, ſo frequently accompanying advanced Aſthma, the diſeaſe of the head is ſtill more frequent.

A lady, worn out with a Dropſy, was ſeized with Inſanity, and remedies were then ſucceſsful in removing both affections.* "Ut

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* Mead Monit. et Præcep. Med. p. 72.

" poſt aliquot menſes mens ſana ſano cum
" corpore rediret."

From a conſideration of the cauſes aſſigned to Inſanity by the learned Dr. Arnold,* there can be no difficulty in aſſenting to the connection between the diſeaſes explained above.

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* Obſervation on the nature, kinds, cauſes, &c. of Inſanity.

SECT. X.

The ſymptoms of Aſthma analytically *explained.* —*The diagnoſtics of Cullen.*—*Additional ſymptoms conſidered, and referred to the ſame cauſes.*—*Remiſſions of convulſive reſpiration.*—*Anxiety of the præcordia, and ſtraitneſs of the breaſt.*—*Itching of the neck and breaſt.*—*Obſcure heat without fever.*—*Dyſpepſia.*—*Head-ache, ſleepineſs, and flatulence.*—*Nocturnal acceſs of the paroxyſm.*—*The power of volition in ſuſpending Epilepſy and Aſthma.*—*Aſthmatic diabetes.*—*Straitneſs of the breaſt.*—*The union of oxygen with the blood, the abſorption of heat, and the diſcharge of aqueous vapour.*—*Deficiency of oxygen from the condition of the veſicles, and conſequent debility of the heart and arteries.*—*Polypi of the heart.*—*Syncope.*—*Irregular pulſe.*—*Coldneſs of the lower limbs.*—*Irritability of the mind.*—*The intermitting pulſe.*—*Correſpondence of the ſtomach and heart.*—*Expectoration of black mucus.*—*The blood ſaturated with carbon.*—*General remarks.*

THE *general* conſiderations in the former Sections, the authority of paſt experience, and the pathological obſervations of modern phyſicians, applied to Aſthma, appear to ſupport the doctrine of ſerous effuſion having excited the convulſive reſpiration. A more particular *analyſis* of the diſeaſe will not detract from this concluſion, but, on the contrary, confer additional ſtrength on its force.

The ſymptoms which form the paroxyſm may be explained with more conſiſtency, as derived from the ſtate which is here attributed to the lungs, than by any other theory at preſent advanced. The diagnoſtics of Dr. Cullen are eſpecially combined with that condition of the exhalents which has been deſcribed.

The *Difficulty of Breathing** ariſes from the accumulation of ſerum in the veſiculæ and bronchia, by which thoſe cavities cannot admit their appropriated fluid to the extent of meaſure which makes a full inſpiration of air; and this very difficulty conſiſts as much in the convulſive efforts of the reſpiratory muſcles to relieve the organ, as in the mechanical impediment to the ingreſs of the air ſo neceſſary to its functions: a diftinction founded with great truth on an accurate obſervation of the phænomena, but too careleſsly marked in the ambiguous words "Spirandi difficultas."

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* Sect. II.

The *Straitneſs** of the breaſt is a perception of uneaſineſs from the want of a full inſpiration of air, and the diminiſhed capacity of the air veſicles and bronchia; the oppoſition to the deſcent of the diaphragm ſtill further preventing their expanſion. This perception is not clearly diſtinct from that of *anxiety*, and will be further adverted to.

The *Wheezing Reſpiration*† is owing to the ſame diminiſhed area of the cavities of the bronchia as neceſſarily occaſions the ſtraitneſs of the breathing, and poſſibly to the contractions of the muſcular fibres of the elaſtic bronchia being aſſociated with the convulſions of the external muſcles; but this cannot be aſcertained.

The *Cough*‡ is ſmall, and interrupted at the beginning of the paroxyſm, becauſe the quantity of effuſed lymph ſuppreſſes the internal action of the air cavities at that period of the diſeaſe; but it is more free and open at the decline of the ſymptoms, becauſe the oppreſſive fluid is ſo far diminiſhed by the abſorbing veſſels, as to become controulable, and to admit the expirations which conſtitute cough.

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* Sect. VIII. † Ibid. ‡ Ibid. p. 163.

The Expectoration of *Mucus** which then comes on, and affords relief, is the critical diſcharge of the very material which has offended the ſyſtem, and excited the paroxyſm by its irritation.

But beſides theſe diagnoſtics of the Periodic Aſthma, there are ſymptoms, which, though not conſtantly meeting in the ſame paroxyſm, very generally attend the diſeaſe, and which in their explanation contribute additional ſupport to the eſtabliſhment of the proximate cauſe here delivered.

The *Remiſſions* of reſpiratory convulſive contractions conform to the laws of the animal œconomy, and no other reaſon is neceſſary for their alternation of exertion and reſt. After a muſcle has been for ſome time ſtimulated to contract, a relaxation will ſucceed, though the ſtimulating cauſe may continue in force.* Happy is the Aſthmatic, who, after repeated attacks of the paroxyſm, is not influenced by their impreſſion to obey a ſecondary law, the effect of cuſtom; for contractions of the muſcles will continue at intervals, though the ſtimulus is even removed, as happens in teneſmus for ſome time after the excluſion of acrid excrement.†

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* See Sect. VI. VII. VIII.

The *Acceſs* of violent contraction of the reſpiratory muſcles will at leaſt recur every evening whilſt the irritating offence which excites it maintains its force in quantity; and the paroxyſm only declines as a portion of this offence is diſcharged, and the remainder becomes leſs oppreſſive in the organ: thus, though the whole object is not gained till the paroxyſm ceaſes, ſomething is obtained at every remiſſion of theſe natural efforts. The fits of an ague return in this manner; they intermit; they finally ceaſe whenever the exciting cauſe is removed, whatever, according to the different ſyſtems, that cauſe may be. And this, probably, happens with ſtill fewer exceptions from the ſecondary influence of cuſtom than in the caſe of Aſthma.

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* See Zoonomia, Vol. I. Sect. XII. I. 3.

† Ibid. Sect. XII. IV. 3.

The *Anxiety* in Aſthma is explained by the preſence of ſome irritating offence to be removed; and if that offence ſhould belong to the pulmonary organ, we ſhall be more ſatisfied with the pathology, becauſe it is here that the experience of phyſicians has long referred the perception called *anxiety of the præcordia*; differing very little from the anxiety belonging to Aſthma, and being only an inferior degree of the ſame ſenſation, which noſologiſts have termed "*anguſtia in-pectore.*"

Anxiety ariſes, ſays Gaubius,* when ſome impediment reſiſts the efforts which nature uſes to expel any internal inconvenience; it attends when any difficulty prevents the excretion of fæces from the bowels or bladder, perſpirable or mucous matter, or blood. But the moſt frequent cauſe of anxiety is a diſorder of reſpiration, and a want of freedom in the paſſage of the blood through the lungs.

"Multiplex itaque vitium pulmonis
"varia materie infarcti, ſpaſmo conſtricti,
"tumore, tuberculis, vomica, ulcere obſeſſi,
"aut aere, aqua, ſanguine, pure, tumore,

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* Inſtit. Patholog. Med. 686, 687.

" aliove thoracis affectu extrinſecus com-
" preſſi; fiſtulæ item aëriferæ fauciumque,
" qua ſpiritus, meare debet; tum diaphrag-
" matis ac cæterorum, qui reſpirationem
" adjuvant, muſculorum; aëris denique fri-
" gore, calore, levitate, humiditate, elateris
" defectu, ſitu, inquinamento, peccantis
" multivaria labes huc faciunt."

An *Itching of the Skin* of the breaſt and neck is frequently a ſymptom in the aſthmatic paroxyſm, ſometimes preceding the violence of the fit, and generally declining as the agony of reſpiration increaſes; this depends upon the cauſes which more peculiarly occaſion the anxiety and ſtraitneſs of the cheſt, an inconvenience to be removed, and an obſtruction to the circulation through the lungs, and alſo irritating matter in the firſt paſſages. The latter is not leſs frequently indicated by this ſymptom, than is the condition of the lungs in Aſthma, for hyſteric and hypochondriac patients, who ſuffer dyſpepſia, are very much affected with it; it may alſo proceed from acrimony which is to be diſcharged on the ſkin, and which often accompanies theſe complaints; but in Aſthma it is uſually the effect of ſympathy with the internal diſtreſs of an organ, and follows the progreſs of its motions: in the mean time the ſenſation may produce ſome cutaneous inflammation, and the ſymptom then increaſes; but it by no means is to be conſidered as neceſſarily a part of Aſthma.

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* Gaubii Inſtit. Patholog. Med. 687.

The difficulty with which the venous blood is returned to the heart, from the right ventricle and the pulmonary artery being obſtructed, is an additional cauſe of this affection of the ſkin.

There is ſometimes in Aſthma a remarkable ſenſation pervades the body, accompanying the anxiety of the breaſt, and diſtinguiſhed by an obſcure *Perception* of *Heat*, and a want of cool air. This perception of heat may have induced Floyer to talk of fever in this diſeaſe, but an attention to the pulſe gives no countenance to the obſervation; the quickneſs never amounts to one hundred beats in a minute, and the general ſtandard in uncomplicated caſes is from eighty to ninety. The deſire of cool air is an appetite to inhale a greater portion of oxygen, and the opportunity of obtaining it will be increaſed the oftener the air is changed, or more freſh air admitted.

Cloſeneſs is particularly diſagreeable to the Aſthmatic; and Aretæus has marked the ſenſation of this inconvenience very ſtrongly in his character of the diſeaſe. The appetite for pure air is accompanied with this acute perception of bad, which depends on the ſame cauſe. "The patient," ſays Aretæus, "loves walking in the open air, "with his mouth open, and is diſſatisfied "with the largeſt houſe, which ſeems too "ſmall to breathe in."*

The ſenſe of heat through the body is not a conſtant ſymptom, for more frequently the lower extremities are very cold in the paroxyſm; and when the patient himſelf has the perception of heat in his external parts, there is no increaſe of temperature if the thermometer is applied to the ſkin. I have frequently conſidered this circumſtance, and I can only ſatisfy myſelf by attributing the feeling to a general ſlowneſs of venous circulation in the ſmall ſuperficial veſſels, ariſing from the impediment to a free entrance of the blood into the right ſide of the heart, and the compreſſion of the pulmonary veſſels giving occaſion to it, whilſt the vigour of arterial impulſe is lowered in proportion to the debility of the heart. In theſe circumſtances the venous capillaries muſt ſuſtain their ſhare of the general turgeſcence.

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* Arctæus, Lib. III. Cap. XI.

Dyſpepſia is a condition of the habit which will be found always to have preceded the Periodic Aſthma; and it compriſes in its train the flatulencies of the ſtomach and bowels, the pain over the head and eyes, and the ſleepineſs, which are amongſt the *terrentia* of this diſeaſe: theſe ſymptoms are therefore part of the prediſpoſition which introduces the diſorder, but which may alſo exiſt independent of its attack.

The *Attack of the Paroxyſm in the night* is a peculiar feature, and gave riſe to the following ſuggeſtion of the ingenious Mr. Charles Darwin.

"*Do the periodic returns of nocturnal
" Aſthma riſe from a temporary dropſy of
" the lungs, collected during their more
" torpid ſtate in ſound ſleep, and then re-

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* Vide Zoonomia, Sect. XXIX. Vol. I.

" abſorbed by the vehement efforts of the
" diſordered organs of reſpiration, and carried off by the copious ſweats about the
" head and neck?"

The ſuppoſition of the retrograde motion of the lymphatics can ſcarcely ſupport this theory, becauſe it is an uncommon criſis in Aſthma which is diſtinguiſhed by copious ſweats about the head and neck, and the vehement efforts of the reſpiratory muſcles are, in fact, the uſual exerciſe of the function of reſpiration urged to an exceſs, to diſcharge in vapour, or by cough, the extravaſated fluid; theſe efforts becoming convulſive are not the more uſeful, but they doubtleſs diſcover that an offence is to be removed.

It is, notwithſtanding, a proof that the writer ſaw in the diſeaſe before us an hydropic effuſion, which could only be removed by the extraordinary energy of the ſyſtem. The Author of Zoonomia countenances the opinion, that an irritation occaſions the diſorder.

" Whatever," ſays Dr. Eraſmus Darwin,*
" may be the remote cauſe of paroxyſms of

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* Zoonomia, Vol. I. Sect. XVIII.

" Aſthma, the immediate cauſe of the con-
" vulſive reſpiration, whether in the Com-
" mon Aſthma, or what is termed the
" Convulſive Aſthma, which are perhaps
" only different degrees of the ſame diſeaſe,
" muſt be owing to violent voluntary ex-
" ertions to relieve pain, as in other con-
" vulſions; and the increaſe of irritability
" to internal ſtimuli, or of ſenſibility dur-
" ing ſleep, muſt occaſion them to com-
" mence at this time."*

The muſcles ſubſervient to reſpiration have been ſaid by anatomiſts to be in ſome meaſure influenced by volition, and on this account they have long ſince diſtinguiſhed them as having a mixed motion, that is, partly voluntary, partly involuntary. From a conſideration of the natural influence which excites them being conſtituted of two powers, it will readily occur, that reſpiration will be performed in the moſt perfect manner when neither of theſe powers is deficient, and that in proportion as one is feeble, the function will be ſerved with leſs energy of action. The powers alluded to are thoſe of volition and irritation, which phyſiologiſts muſt have had in view, however indiſtinct the perception of their operations may have been, before that luminous body which has informed and directed the ſtudents of nature, was given to ſcience and futurity by the author of Zoonomia.

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* In the ſecond volume of Zoonomia, the author modifies the aſſertion in the former, and thinks the Humoral and Convulſive Aſthma differ eſſentially from each other: a diſtinction, however, which had ſo long eſcaped his obſervation, ſeems not to be very firmly eſtabliſhed. In fact, the abſence of mucus in ſome fits of the Aſthma, or the acceſs of the diſorder not occurring at the uſual periods, or at the cuſtomary hours, can ſcarcely ever be traced to two regular deviations; and it is acknowledged, that the humoral and convulſive are ſo intimately blended, as to make the taſk of finding a different cauſe for each much more embarraſſing than that of aſſigning preſumptive evidence of natural laws as the reaſon of the occaſional abſence of one or more of the common phænomena. But though Dr. Darwin retires from his opinion of the probable cauſe of both being the ſame, as conſiſting in a fluid to be abſorbed, he ſtill gives his aſſent to the principle of ſome pain, to be relieved in the lungs or ſome diſtant part; and finally, the diſtinction appears only to reſt on the choice of a ſenſorial power moſt adapted to excite the phænomena.

The paroxyſm of Aſthma makes its attack, ſays Floyer, about two o'clock in the morning, when the chyle is moſt plentiful in the blood.

According to Dr. Withers,* "the rea-"ſon why the fits ſo often occur firſt in "the night, is thought to be owing to the

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* Dr. Withers's Treatiſe on the Aſthma. p. 6.

" heat of the bed, and the horizontal poſ-" ture in which the patient lies." There is ſomething indiſtinct in both theſe explanations, which ſeem not to apply with very cloſe preciſion to the theories which thoſe authors eſpouſed.

It is of more importance to ſay, that it makes its attack after the patient has been abſorbed in ſleep, rendered heavy, if not compoſed, by the condition which in dyſpepſia is ſo ready to communicate torpor from the ſtomach to the head; and when, by the delay in the paſſage of the blood from the right to the left ventricle of the heart, the veſſels of the head are affected with local plethora and diſtention. Under theſe circumſtances, volition being ſuſpended, irritation is to perform the whole duty. Effuſion of ſerum in the veſiculæ of the lungs had previouſly taken place, and from the condition of the pulmonary veſſels muſt be rapidly increaſing. If reſpiratory action is now diminiſhed, that moment when the oppreſſion of the accumulated fluid can be no longer borne will be accelerated, becauſe leſs vapour will be exhaled in expiration, and the abſorbing veſſels will be inadequate to remove the inconvenience by their power alone.

When this period arrives, thoſe extraordinary efforts commence which conſtitute the paroxyſm of Aſthma, and are the *niſus* of nature to relieve herſelf of pain.

It appears, therefore, that the material will be increaſed by ſlumber, and create more embarraſſment in the lungs as its bulk extends; but Providence has eſtabliſhed other checks to impede the progreſs of diſeaſe in the time of ſleep. Volition being ſuſpended, the powers of ſenſation and irritation are more active. "Our irritability "to internal ſtimuli, and our ſenſibility to "pain or pleaſure, is not only greater in "ſleep, but increaſes as our ſleep is pro-"longed."*

Volition then having ceaſed to excite reſpiratory action, the effect of accumulated fluid is felt with increaſed ſenſation, and increaſed irritation; and thoſe two powers of the ſenſorium are ſo active, as ſpeedily to excite the dormant influence of volition. The patient is rouſed by their combination, and ſuſtains the violence of convulſive reſpiration.

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* Zoonomia, Vol. I. Sect. XVIII.

Volition evinces its power in this diſeaſe by protracting the interval between the fits, which may be avoided by active attention of the ſenſes when the ſerum is not yet accumulated to ſuch a bulk as to be inſupportable. The ſame power is exhibited in Epilepſy as in Aſthma. A young man has been affected with Epilepſy from the age of thirteen to nineteen: it moſt frequently makes its attack in his ſleep, but before his ſenſes are gone he perceives the ſudden invaſion. If his ſleep is profound, and the head affected in the very firſt inſtance, he cannot ſtop its progreſs, though he has a confuſed ſenſe of his ſituation; but ſometimes he has ſufficient warning by numbneſs in his right hand, a tingling, or a pain, and in this caſe he ſtarts from his imperfect ſlumber, and uſing exertion of his muſcles, with attention of mind, he can ſucceed in ſtopping the fit, even after the attack is begun. This inſtance of Epilepſy is marked with irritation in the ſtomach; a load of viſcid phlegm is perceived to oppreſs that organ, and ſtrong emetics have occaſioned its evacuation in large quantities, with temporary relief.

Sir John Floyer could protract his fit by denying himſelf reſt. "* I have found that

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* Treatiſe on the Aſthma, p. 94.

" by late ſitting up I have put by the fit for
" a night or two; and I have found it com-
" monly neceſſary to riſe out of bed, eſpe-
" cially in the ſummer time, and to ſleep in
" a chair the firſt night of the fit. Two
" nights before the fit Aſthmàtics want ſleep
" frequently." The fit threatens to take place two or three nights before the attack, and the power of volition is excited to prevent it, which, until the cauſe has proceeded to its *acmé* of ſtrength, is equal to the taſk, at the expence of ſleepleſs nights.

But the paroxyſm does not always come on in ſleep, for after frequent attacks of the diſorder, a period of return is introduced into the habit, which becomes part of its œconomy, and is too powerful to be counteracted by preſerving to volition all its activity. Here the ſame force of habit operates which influences the diſorders of the body in other inſtances, even after the cauſe which firſt excited them is entirely removed. This conſideration ſhould have induced the learned Dr. Darwin to have adhered to the opinion expreſſed in the paſſage above quoted.

The *Aqueous Diabetes* is to be attributed very generally to the diatheſis which is eſtabliſhed in the habit. In this diatheſis a weakneſs of the ſolids, and a watery condition of the blood, ſufficiently mark the the ſymptoms as an hydropic effuſion from the exhalents of the kidneys, accompanying a ſimilar effuſion from the exhalents of the lungs.

It appears alſo that the arterial exhalents of the kidneys may be relaxed by the ſudden impreſſion of paſſions of the mind, as is uſually the caſe in Hyſteric Aſthma.

This diſcharge of pale water, in the opinion of Floyer, is owing to the conſtriction of the lymphatics which ought to carry off the remaining ſerum; but there appears ſuch a profuſion in a given time, as only to be explained by an exceſs of water from the arterial capillaries, which pour out their contents faſter than the abſorbents can take up their portion, and the morbid dilatation of the exhalents muſt be altered, as is the caſe in the progreſs of the paroxyſm, before the balance is reſtored, and healthy urine is diſcharged from the bladder, and in moderate quantity; frequently indeed, from a natural exceſs of energy in the abſorbents to finiſh an extraordinary work, in leſs quantity than is uſual; the urinary fæces having leſs than ordinary dilution.

The tendency to diſcharge copiouſly watery urine, accompanies more or leſs all the varieties of Aſthma which make their attack periodically. The kidneys receive nerves from the intercoſtals, and thus far we are led to a ſuppoſition of ſtrong aſſociation of motion in the kidneys, ſtomach, and lungs.

Speaking of Chronic Diabetes, Dr. Ferriar ſays, " in the caſes which I have ſeen, " dyſpeptic ſymptoms have always preceded " this diſorder;"* and Sydenham† had regarded diabetes as dependant on a dyſpeptic condition, and an impoveriſhed ſtate of the blood.

Dyſpepſia, whether it attend Hyſteria or Aſthma, or both, ſeems to be ſtill intimately connected with the temporary Diabetes, becauſe this ſymptom may be frequently obſerved to take place when flatulence or gluttony diſtends the ſtomach, independent of either of thoſe diſeaſes. This may partly be accounted for from the ſtate of the ſtomach, which, diſtended to a great bulk, compreſſes the veſſels bringing back blood from the lower viſcera to the heart; the emulgents will then find a difficulty in forwarding their contents by the correſponding veins, and muſt relieve themſelves by opening a paſſage for their ſerum into the urinary cavities of the kidneys. The oftener this neceſſity occurs the readier will be the exit, and more reſorted to by the animal œconomy as an habitual mode of relief.

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* Med. Hiſt. & Reflections, Vol. II. p. 53.

† Sydenhemi Epiſtola, Reſponſoria I. p. 271.

Mr. Cruikſhank* points out a ſpecies of Dropſy explaining very ſufficiently the pathology of this Diabetes: " When the arte-
" ries find a great reſiſtance to their throw-
" ing their blood into the veins, they are
" obliged to relieve themſelves by an in-
" creaſed ſecretion from their exhalents."

Dr. Saunders† takes a more extenſive view of hydropic effuſions from this cauſe.

" If a principal vein is compreſſed and
" the artery is free, the veins below the
" preſſed part become diſtended, the limb
" is enlarged, and œdema follows: becauſe,
" by the preſſure, reſiſtance was formed to

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[*] Anatomy of the Abſorb. Veſſels, p. 116, 117.

[†] Treatiſe on the Structure, Œconomy, &c. of the Liver, 2d Edit.

" the action of the arteries. The arteries
" uſe greater exertion to overcome the re-
" ſiſtance, but as the exhalents are part of
" their ſyſtem, they partake of the general
" effect, and an effuſion of their watery
" contents follows."

The diſcharge of watery urine does not appear to afford relief to the lungs in the paroxyſm of Aſthma. If this Diabetes was uſeful, it would ſtill confirm the pathology of Aſthma here delivered, as it would point out the abſorption of ſerum in the cells of the lungs, which, as in other hydropic caſes, is diſcharged into the bladder.

Anaſarca admits of periodical relief during the night, when irritability is increaſed, abſorption is powerfully excited, and water is haſtily determined to the kidneys. It may therefore be allowed, that a ſimilar abſorption may be excited in Aſthma, and the effuſed fluid thus withdrawn from the veſiculæ may be carried to the kidneys in extraordinary quantity. But neither is this Diabetes confined to the night, nor does it in fact apparently alleviate the labour of reſpiration ; it ſeems, on the contrary, to precede or accompany the effuſion into the veſiculæ, inſtead of following it. It continues whilſt the acceſſions of the diſorder laſt, and it is reduced to a healthy ſtandard when they finally ceaſe, and when it may be ſuppoſed the balance between exhalation and abſorption is generally, as well as locally, reſtored. Various conſiderations preſent themſelves to induce a conviction of this being the true pathology of the Aſthmatic Diabetes.

The hydropic diatheſis cannot be concealed in the advanced ſtate of the Aſthma, for by the teſtimony of every medical authority it terminates very frequently in anaſarca.

Anaſarca, in its commencement, is attended with great diſcharges of water; and before that ſpecies of Dropſy comes to be ſuſpected, the exhalents of the kidneys permit the paſſage of great quantities of water, which for ſome time may ſuſpend a depoſition of it in the cellular membrane, or cavities of the body. Thus does Aſthma connect itſelf with Dropſy by this intermediate link, as well as by the effuſion into the veſiculæ of the lungs; and the obſolete term of *Hydrops ad Matulam* ſeems well appropriated to the aqueous effuſion now called Diabetes.

Though this affection in Aſthma is temporary as a ſymptom of the diſorder, the frequent recurrence of the complaint, and a degenerated condition of the fluids of the body, have often made it permanently diſtreſſing, and by the teſtimony of M. Sauvage induced a true Diabetes.

The *Straitneſs of the Breaſt* not only ariſes from the mechanical obſtacle to a full inſpiration of air, and the internal action of the bronchia ſuppreſſed in expiration, by the ſerum effuſed; but the ſenſe of uneaſineſs which has acquired this term muſt be aggravated in proportion as the extent of a cloſe application of oxygen to the pulmonary veſſels is diminiſhed. M. Lavoiſier proves, that of the oxygen which diſappears in reſpiration *four-fifths* are conſumed by a combination with the carbon of the blood, forming carbonic acid gas; the remaining *fifth* is either abſorbed by the blood, or uniting with hydrogen diſcharged from the blood, forms aqueous vapour.

Dr. Crawford* ſhews, that this component part of the atmoſphere furniſhes heat to the animal ſyſtem. The comparative heat of florid arterial blood is to that of venous as eleven and half to ten. "Hence," ſays this Philoſopher, "as the blood returned by "the pulmonary vein to the heart has the "quantity of its abſolute heat increaſed, it "muſt have acquired it in its paſſage "through the lungs. A quantity of abſo-"lute heat is therefore ſeparated from the "air in reſpiration, and abſorbed by the "blood." The manner in which the operation of abſorbing heat takes place, is ſubject to the laws of chemical elective attraction. "The pure air is received into the "lungs, containing a great quantity of "elementary fire; the blood is returned "from the extremities, impregnated with "the inflammable principle; the attraction "of pure air to the latter principle is greater "than that of the blood: this principle will "therefore leave the blood to combine with "the air; by this combination the air is "obliged to depoſit a part of its elementary "fire, and as the capacity of the blood is at "the ſame moment increaſed, it will in-"ſtantly abſorb that portion of fire which "had been detached from the air."*

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* Exper. and Obſervations, &c. p. 355.

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* Dr. Crawford's Exper. &c. p. 362.

It is now beyond a queſtion that a principal duty of reſpiration is to impart heat to the blood, and to furniſh it with the quality which oxygen poſſeſſes of ſtimulating the heart and arteries to more vigorous contractions. It will therefore be ſufficiently plain, that anxiety of the præcordia, and uneaſineſs from ſtricture of the breaſt, may be increaſed or alleviated as this principle is more or leſs cloſely applied to the internal ſurface of the air cavities, through the texture of which it is imbibed: hence the Aſthmatic eagerly deſires an open expoſure, and a change of air, becauſe the more air is changed in a given time, the more oxygen is abſorbed, and the greater vigour is produced. But the condition of the veſiculæ does not facilitate the operation, filled more or leſs with ſerum, that precludes the ready combination of this animating principle with the blood.

Dr. Goodwin proves by his experiments how neceſſary reſpiration is in producing that quality of the blood by which it becomes capable of exciting the contractions of the heart; and he ſtill further diſcovers, that a fluid in the air cells, introduced by the act of drowning, is an important obſtacle to the union of pure air with the blood, and frequently prevents the reception of its ſtimulus, by the efficacy of which the contractions were to be reſtored. This inconvenience was to be removed, in his opinion, before animation could, in ſome caſes, be ſecured. He ſays, "ſometimes there is water inſinuated "into the ſmall branches of the trachea, and "into the air cells. If the lungs are in"flated in this ſtate, the water will occupy "thoſe places where the freſh air is princi"pally required; and although the lungs "be inflated with the utmoſt care and at"tention, it may be impoſſible, on this "account, to apply the freſh air ſufficiently "near the ſinus venoſus and left auricle, "to change the quality of the blood they "contain: the water is therefore to be firſt "removed." In a note he adds, "this "opinion is verified in ſome young ani"mals, where the lungs contained a conſi"derable quantity of froth after ſubmerſion: "if I inflated them fully in this ſtate, the "colour of the blood in the ſinus venoſus "and left auricle was not apparently "changed, and the heart did not renew "its contractions, although it ſtill retained "the faculty of contraction, &c."*

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* Dr. Goodwin, Connection of Life with Reſpiration, Sect. VII.

We have therefore the authority of experiment to ſupport the opinion which has been here delivered on the cauſe of ſome of the moſt remarkable ſymptoms which diſtinguiſh the paroxyſm of Aſthma. The accumulation of ſerum in the air cavities of the lungs may be productive, in its ſimple mechanical bulk, of uneaſy ſenſation, by taking the place of a finer fluid adapted to the organ: but conſidering its influence more comprehenſively, it may be the cauſe of a deficient excitement of the contractions of the heart; the blood will then ſtagnate with greater delay in the ventricles and pulmonary veſſels, but more particularly in the right ventricle, becauſe the current through thoſe veſſels is rendered ſlow and difficult by external compreſſion; hence *Polypi* have ſo often been diſcovered in the cavities of the heart and large veſſels of aſthmatic ſubjects.* The patient may, from this condition, be affected with *Syncope*, and *Irregularity of Pulſe*. The irritability of the heart being unequally excited, at one time its action may be languid, becauſe the blood has loſt its ſtimulating property; and occaſionally its contractions may be energetic and ſtrong, becauſe its cavities feel the excitement of uncommon diſtention. Thus ſenſations of ſtraitneſs and anxiety may ſeverally or jointly be produced, and other ſubordinate ſymptoms may be ſatisfactorily explained.

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* See Part I. Sect. III. p. 40.

The *Coldneſs* of the lower limbs proceeds from the deficiency of animal heat; and the *irritability* of the mind from the anxiety of the præcordia.

The *Intermitting Pulſe* which Floyer attributes to the conſtriction of the arteries, from the action of the circumvolving nerves, may naturally proceed from the condition of the heart, which, if not deprived of its principle of irritability, as is aſſerted by Girtanner, muſt however ſenſibly feel the want of ſtimulus in the quality of the blood. This ſymptom may be alſo occaſioned by inferior cauſes, comprehended in the pathology of Aſthma. The dyſpeptic flatulence of the ſtomach impeding a full expanſion of the lungs, mechanically obſtructs the free paſſage of the blood through them, and of courſe deprives their extenſive ſurface of the full application of the air by which oxygen becomes united to the blood.

There is an acknowledged ſympathy between the ſtomach and the heart, but Dr. Darwin explains it as follows:

“ The aſſociation, or ſympathy of motions between thoſe of the ſtomach and “ thoſe of the heart, are evinced in many “ diſeaſes. Firſt, many people are occa- “ ſionally affected with an intermiſſion of “ their pulſe for a few days, which then “ ceaſes again. In this caſe there is a ſtop “ of the motion of the heart, and at the “ ſame time a tendency to eructation from “ the ſtomach. As ſoon as the patient feels “ a tendency to the intermiſſion of the mo- “ tion of his heart, if he voluntarily brings “ up wind from his ſtomach, the ſtop of “ the heart does not occur. From hence I “ conclude, that the ſtop of digeſtion is “ the primary diſeaſe; and that air is in- “ ſtantly generated from the aliment which “ begins to ferment, if the digeſtive proceſs “ is impeded for a moment. The ſtop “ of the heart is in conſequence of aſſo- “ ciation of the motions of theſe viſcera; “ but if the little air which is inſtantly ge- “ nerated during the temporary torpor of “ the ſtomach, be evacuated, the digeſtion

" recommences, and the temporary torpor of " the heart does not follow."*

The pathology of Dr. Darwin is doubtleſs founded upon the moſt attentive obſervation, but after the experiments of Dr. Goodwin, which convincingly prove the influence of oxygenated blood on the contractions of the heart, the torpor of that organ may very conſiſtently be attributed to the occaſional deficiency of a vital ſtimulus in Aſthma, when the ſtomach is ſo diſturbed with flatulence as to impede the deſcent of the diaphragm, and when, in addition to dyſpepſia, the internal condition of the lungs is adverſe to the application of atmoſpheric air, and the combination of oxygen with the pulmonary blood.

If we attribute the correſpondence between theſe organs to the intervention of nerves, the difficulty is increaſed by conſidering the inſenſibility of the heart to every ſtimulus but that of the blood poſſeſſing its healthy qualities. Haller aſſures us, that the ſubſtance of the heart has very few nerves; and M. Behrends allows a ſtill more inconſiderable number, and thoſe of trifling

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[*] Vide Zoonomia, Vol. I. Sect. XXV. alſo XXIII. 4. and XXXV. I. 4.

magnitude, terminating in the coronary veſſels.

Spitting of *Black Mucus* is a ſymptom often occurring, but not invariably, in Aſthma, as well as in the pituitous conſumption.

Amongſt the ſigns affording a prognoſtic of Conſumption, Morton places the expectoration of black and viſcid phlegm in a morning. He tells us, that it proceeds from the glands near the windpipe being filled with a black humour, a ſymptom common to ſcrophulous and ſcorbutic ſubjects, and indicating a probable conſequence of an Aſthmatic Conſumption.*

But theſe glands have not been diſcovered to communicate with the cavities of the windpipe or bronchia, and the mucus is therefore not coloured by an effuſion of their contents.

Yet they have been found, upon diſſection, filled with black matter. By the teſtimony of Morgagni, in three bodies out of four which he examined with this object in view, the black colour was diffuſed through the glands, and paper being rubbed over the diſſected portions, it aſſumed a ſooty tincture, not different from powdered charcoal diluted with a good deal of water.

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* Phthiſiolog. Lib. II. Cap. II. 10.

He however denies, that the black mucus which is ſaid to be expectorated in certain caſes can have had a natural excretion into the trachea or bronchia, from theſe glands, but allows, that eroſion in diſeaſe may poſſibly have opened a paſſage.*

There is, therefore, an expectoration of black mucus, which could have no other ſource than the capillary exhalents of the veſicles, or glandules of the membrane of the trachea and bronchia, which open into thoſe air pipes; and there is alſo a ſimilar black appearance in the bronchial glands which are not connected with the air cavities. It is alſo obſervable, that by Morton's teſtimony ſcorbutic habits are very liable to the ſymptom, and that it leads to Aſthmatic Phthiſis.

Dr. Willis remarked, that ſome patients had frequently in the day, but particularly in the morning, " Sputum inſtar atramenti " nigricans."†

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* Morgagni de Cauſis et Sedibus, Epiſt. XXII. Art. 21.

† Willis Opera, Vol. II. de Phthiſi Pulmonali, p. 49.

Floyer* deſcribes this ſymptom as belonging to the Hyſteric Aſthma, as well as to the Periodic, and as giving the appearance of feathers; and Dr. Withers had obſerved it in many caſes.†

I have frequently remarked an expectoration of black mucus in Aſthmatics, when there could be no ſuſpicion of the rupture of any ſmall veſſels. I believe the material which colours the mucus is the carbon of the blood, which in the healthy ſtate of the ſyſtem was exhaled in carbonic acid, the atmoſpheric air having been then properly decompoſed. The exhalent orifices of the pulmonary artery have been ſhewn to be morbidly dilated, and inſtead of exhaling vapour, permit the eſcape of a condenſed liquid.

The habit of an Aſthmatic is generally diſtinguiſhed by cold extremities, and a blue ſkin; the former almoſt always prevailing, the latter frequently. Dyſpepſia is accompanied with watery blood, and weak contractions of the muſcles. A prediſpoſition is exhibited in theſe circumſtances favourable to the opinion of Dr. Beddoes, that in Aſthma the ſyſtem is invigorated with too ſmall a proportion of oxygen.

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* Treatiſe on the Aſthma, p. 11—19.

† Withers's Treatiſe, &c. p. 8.

When the accumulation of ſerum produces the paroxyſm, it will alſo prevent the ready abſorption of oxygen by the blood. The heat of the lungs in Aſthma is below a healthy ſtandard, and a certain temperature is requiſite to promote the chemical proceſs of oxygenating the blood, and imparting heat to the ſyſtem.

The prediſpoſition, therefore, of the body being cold, the blood will be more phlogiſticated, and have more carbon to diſcharge in reſpiration, even when the accumulation of ſerum has not yet produced the paroxyſm of Aſthma.

Dr. Prieſtley had proved, that the livid colour of the blood in the veins depended upon its union with the inflammable principle; and it is poſſible to conſider, in the prediſpoſition to Aſthma, a condition of the arterial blood approaching too much to the character of venous blood deſcribed by that Philoſopher: for the coldneſs and torpor of the habit may certainly have long continued to injure the oxygenation of that fluid.

" When an animal," ſays Dr. Crauford, " is placed in a cold medium, the venous " blood aſſumes a much darker hue than " when it is placed in a warm medium.

" Admitting that the ſenſible heat of " animals depends upon the ſeparation of " abſolute heat from the blood, by means of " its union with the phlogiſtic principle in " the minute veſſels, may there not be a certain temperature, at which that fluid is " no longer capable of combining with " phlogiſton, and at which it muſt of courſe " ceaſe to give off heat?

" The air expired from the lungs of an " animal is more phlogiſticated in a cold " than a warm medium."*

This ingenious Philoſopher concludes from his experiments, that " when an animal is placed in a warm medium, the " colour of the venous blood approaches " more nearly to that of the arterial, than " when it is placed in a cold medium; the " quantity of reſpirable air, which the animal phlogiſticates in a given time, in the " former inſtance, is leſs than that which it " phlogiſticates, during an equal ſpace of " time, in the latter; and the quantity of

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* Exper. and Obſervat. p. 311.

" heat produced, when a given portion of
" pure air is altered by the reſpiration of an
" animal, is nearly equal to that which is
" produced when the ſame quantity of air is
" altered by the combuſtion of wax or char-
" coal."*

The inferences from the above facts are, that by whatever means the prediſpoſition to Aſthma may be acquired, it is chiefly characteriſed by a low temperature, weak ſolids, and watery fluids; in other words, hydrogen holding carbon in ſolution predominates in the ſyſtem, and gives to the arterial too much of the colour and quality of venous blood.

In healthy reſpiration the oxygen having a ſtronger attraction to the carbon of the blood than to the other components of atmoſpheric air, is abſorbed through the ſoft and vaſcular membrane of the air cells, and combines with carbon, to be exhaled as carbonic acid in expiration; but if the air cells are obſtructed with ſerous fluid, the oxygen cannot be attracted to enter into this new combination, becauſe the atmoſpheric air cannot be inſpired to the requiſite depth, and come cloſely into contact with the membrane, through the texture of which the union is accompliſhed: the carbon muſt therefore remain in the blood in greater quantity than was uſual, and an extraordinary portion will be involved in the ſerum effuſed by the capillary exhalents; and in this condenſed form, and without the aid of a healthy temperature, the proceſs of oxygenation and diſcharge of carbonic acid cannot take place; but the expectorated phlegm ſhews more or leſs of the excrementitious matter of the blood in the appearance of black mucus. The mucus is alſo ſtreaked, or bears the appearance of feathers, from the carbon colouring it in the pipes of the lungs, and the mucus carrying the impreſſion of theſe molds as it becomes thickened, theſe lines of black being connected with a ſerum leſs deeply carbonated, and deſcending to fill their intervals.

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* Exper. and Obſervat. p. 352.

An expectoration of this quality can only be ſuppoſed when a very conſiderable extent of the veſicular ſurfaces is covered from the contact of air by a coat of ſerum; but the prediſpoſition of the blood, which leads to the Pituitous Conſumption as well as Aſthma, may at all times favour the appearance;

and, according to the teſtimony of Morton and Willis, the effect occaſionally takes place in both. The ſpecies of Conſumption called *pituitous*, is, in fact, a caſe in which there are contra-indications, and in its commencement will not allow a certain prognoſtic of which diſeaſe it may finally bear the character: of Aſthma or Phthiſis.

If the mucus is not black, it may be pellucid, or yellow, according as it is digeſted, or has remained in the follicles of the trachea or veſicles more or leſs time previous to the diſcharge. If it is tinged with blood, it is apparent that the capillary apertures are ſo dilated as to permit red globules to paſs. In caſes where this appearance occurs, there is more force in the contractions of the arteries than common: I have alſo obſerved the pulſe to be from eighty-ſix to ninety-ſix, and the exciting cauſes were violent exerciſe, with a bound belly; but even here I ſaw no advantage from blood being taken away, as the ſymptom did not remit ſooner than the patient, who was an experienced Aſthmatic, had formerly known. Mucus of a ſaltiſh or ſweetiſh taſte has had minute portions of blood in the maſs, and undergone more heat than generally prevails in the lungs of Aſthmatics; and it is probable that expectoration of this quality proceeds chiefly from the excretory follicles of the trachea, in which ſome catarrhal inflammation had been united to the general ſymptoms.

Sleepineſs comes on ſitting, but not leaning backwards, according to Floyer. This is in the *acmé* of the paroxyſm, when the oppreſſion of the fluid is moſt conſiderable, and an erect poſture abſolutely neceſſary to reſpiration. In this ſtate a reclining poſture would give additional embarraſſment to the proceſs of inſpiring air, becauſe the ſtomach and lower viſcera would preſs more againſt the diaphragm than when in their depending ſituation.

The neceſſity of an erect attitude is alſo to be accounted for by the obſtruction to the paſſage of the blood through the pulmonary artery occaſioning a plenitude and delay in the right ventricle, and in courſe an oppoſition to the free entrance of venous blood from all parts of the body into the heart; but if the cavities of the ventricle and pulmonary veſſels are ſo much leſſened or occupied, a reclining poſture, by impelling the circulation towards the heart, muſt increaſe the anxiety, the ſtraitneſs, and the ſuffocative ſenſation occaſioned by the obſtruction at preſent ſubſiſting; ſleep will therefore be more oppoſed by the exertions of volition to preſerve reſpiration and life, than it will be promoted by the fullneſs of the veins of the head, the dyſpepſia of the ſtomach, and the debility and the languor of the habit; all theſe cauſes may indeed concur to produce the ſymptom of lethargy, but a more powerful inſtinct to preſerve life in the extremity of the diſorder averts their effect.

The *Pulſe* of an Aſthmatic is generally feeble; as the fit approaches a temporary increaſe of fulneſs and ſtrength may be occaſionally perceived in young ſubjects; but the indication is not to be depended upon, for in the progreſs of the paroxyſm the ſymptom vaniſhes, and weakneſs ſucceeds, with frequency, but the pulſations ſeldom exceed ninety in a minute.

When the pulſe is moſt frequent the mouth is moiſt, and there is often a whitiſh mucus upon the ſurface of the tongue. Thirſt ſeldom attends, either in the paroxyſm or in the intermiſſion.

The *Urine* is very pale and copious before the fit, and during its progreſs; it is alſo frequently copious and pale without the fit coming on, but attending on occaſional indigeſtions, to which the Aſthmatic is for ever liable. When the fit goes off there is no remarkable depoſition in the urine, but it is muddy, and generally in leſs quantity than is natural to health. If the urine is copious and pale, it is, I believe, never ſweet. I have taſted the water of an Aſthmatic more than once, when the circumſtance of quantity and appearance ſtrongly ſolicited my curioſity, but I always found it weak, ſaline, and of no ſacharine taſte whatever.

The *Belly* of an Aſthmatic is not often regular; when it has been regular by cuſtom I have generally found that it was lax. If the Aſthmatic is bound in his body, it probably induces a fit; but this ſtate generally alternates with diarrhœa, and both may be accounted for by the dyſpepſia of the firſt paſſages.

There is at the acceſs of the fit a remarkable action of the abdominal muſcles, and of all the muſcles which are in common uſe for the diſcharge of fæces, and the exerciſe of reſpiration. The Aſthmatic finds it impoſſible to reſiſt the impulſe, and before he has much experience he flatters himſelf, that the evacuation will be followed by relief. Circumſtances may be ſo favourable as to confirm his hopes; but I have very ſeldom ſeen this fortunate occurrence. The effort to expel the contents of the bowels may be excited by their acrimony; but the muſcles which are ſubſervient to the diſcharge have ſo often been employed in reſpiratory action to relieve the lungs of irritation, that, whether the irritating cauſe is in the firſt paſſages, the lower bowels, or the lungs, the ſudden invaſion of their efforts may be excited by diſtreſs of one of theſe organs, and it may not be diſtinctly known in which the cauſe reſides; the reſult may, however, ſhew, that all theſe cavities have been offended, that only the ſtomach and bowels have been irritated, and the fit may be ſhort; or that the veſiculæ have been chiefly oppreſſed; and then the fit proceeds in a more regular manner, and terminates with expectoration of mucus to great certainty.

It has been obſerved, that an obſcure ſenſe of heat is perceived ſometimes in the paroxyſm, pervading moſtly the trunk of the body; but the temperature is, notwithſtanding, low, nor does this perception ſo often occur as that of coldneſs.

The *Habit* of an Aſthmatic is generally cold, with the occaſional exception of a ſhort interval in the acceſs, when there is an increaſe of effort in the arterial circulation, which does not continue long. Some exciting cauſes may likewiſe occur to raiſe the temperature of the body; and Dyſpnœa is not ſo likely to be marked with this prevailing ſymptom, as the regular form of Convulſive Aſthma.

If the bulb of a thermometer is put into the mouth of an Aſthmatic at the approach of a fit, the temperature is obſerved to be lower than in the intervals. In the height of the fit I have found the heat of the exhaled vapour confined to the cavity of the mouth at eighty-two of Farenheit, when the ſame ſubject had, the day before, proved the temperature by this teſt to ſtand at ninety-ſeven.

Three hours before the death of an Aſthmatic,* the temperature within his mouth was reduced to ſeventy-three. I have often applied the thermometer, but have not yet been gratified by knowing with how great a diminution of temperature it may yet be poſſible for the patient to recover.

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* See Sect. VII. Obſ. XVI.

If the ſtomach is full or empty, the inconvenience in the paroxyſm is almoſt equal; at leaſt, nothing can exceed the great diſtreſs which the patient feels from a perfect emptineſs in that organ, occaſionally, after the remiſſion is commenced, and exerciſe is purſued to any extent. If the ſtomach is filled in the ſtate of debility which it ſuffers in the paroxyſm, the conſequence is ſufficiently manifeſt: the middle road ſhould carefully be purſued.

The Aſthmatic may ſuffer many or few fits in a certain time: Floyer ſuſtained thirty-ſix in the year; but ſome muſt have been of very ſhort continuance; probably excited by indigeſtion, and relieved as the ſtomach reſumed its healthy function; for it is allowed, that after repeated attacks the habit of convulſive contraction of the abdominal and intercoſtal muſcles will be ſo confirmed, that theſe convulſions may take place from inferior exciting cauſes.

He obſerved, that the Periodic Aſthma was regular once in ten days, but that the Continued was uncertain. When the paroxyſm comes on ſo frequently as once in ten days, I have uſually remarked, that conſiderable Dyſpnœa is permanent between the fits; and it always may be depended upon, that the longer and the more perfect an intermiſſion is, when the genuine Convulſive Aſthma is eſtabliſhed in the habit, the more violent is the acceſſion of the paroxyſm.

The *Mind* of an Aſthmatic is impatient, and he ſuffers much from oppoſition to his own method of management. After ſeveral acceſſions he has aſcertained modes of comfort and ſatisfaction, which the anxiety of his friends may impede rather than promote, by their ſolicitude and attentions: he therefore is irritable, and with difficulty reſtrains his diſpoſition to petulance. But, excepting in the exhauſted habit, vivacity and good humour never fail to return with the freedom of natural reſpiration.

The *Reſpirations* in the paroxyſm are more numerous in a given time than in health, a fact which ſtands in direct oppoſition to the authority of Floyer, and in ſome meaſure diminiſhes the weight of his reputation for accuracy. I have reckoned from twenty to forty reſpirations in a minute, but they never exceed thirty without a very conſiderable increaſe of frequency of pulſe, and a well-grounded indication, that the caſe is complicated with ſome pneumonic inflammation. In ſimple Spaſmodic Aſthma it is, however, remarkable, that the reſpirations are more frequent than in proportion to the contractions of the heart: it is therefore extraordinary that Floyer ſhould ſuggeſt a contrary ſtate, which is not ſupported by any authority, except that of Zecchius, which he quotes: in oppoſition to which Willis deſcribes the reſpiration as "*crebra et anheloſa*;" and Dr. Stark obſerves, that patients in this diſeaſe commonly breathe "*thirty* or *forty* "times in a minute, and ſtill oftener after "eating, or the moſt moderate exerciſe."*

In the advance of hot weather ſome patients ſuffer, with great certainty, the invaſion of the diſorder. Theſe ſubjects, it is probable, met with the inconvenience which will always follow an exceſſive evaporation of fluid: the loſs of heat in the veſiculæ would be in proportion to the quantity of exhalation, and a torpor from cold would affect the capillaries opening into theſe cells; a ſpeedy change in the diameter of the capillary mouths would be induced, and a conſequent effuſion of condenſed liquid. The winter, however, frequently affects the Aſthmatic alſo, but very ſeldom when the weather is cold and froſty, and when the denſity and weight of the air is proved by the barometer; coldneſs and moiſture in conjunction are very unfriendly, and ſeem not only to check perſpiration, but to give to the cutaneous veſſels an imbibing condition.

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* Stark's Works, p. 43.

Much of the hiſtory of this curious diſeaſe has been now delivered, and, I hope, enough to elucidate the nature of the cauſe which immediately occaſions a paroxyſm. In proceeding with the conſideration of the remote cauſes, the exiſtence of mucous irritation in the veſiculæ may be rendered ſtill more probable; but after the preceding remarks, an endeavour to give new proofs a conſpicuous light ſeems to be unneceſſary: my obſervations on the remote cauſes will be accepted, by the medical reader, without heſitation, as they comply at once with the experience of phyſicians, and are naturally connected with ſerous effuſion in the veſiculæ of the lungs.

SECT. XI.

REMOTE CAUSES of CONVULSIVE ASTHMA.

The Prediſpoſing Cauſes.—*The periods of life.—The ſex.—The temperament of Body.—Dyſpepſia.—Its conſequences.—Effect of Dyſpepſia on the circulation and ſecretions.—General debility of the ſolids.—Condition of the fluids.—Senſibility or irritability of the habit.—Lymphatic abſorption curſorily conſidered.—Its importance in the animal æconomy.*

IN purſuing our inquiry after the remote cauſes of that ſerous effuſion in the pulmonary veſicles, which has been deſcribed in the preceding ſections, and which has been ſtated to be the immediate cauſe of a paroxyſm of Aſthma, we find a condition of the body which is liable to be excited by circumſtances internal and external. This is a *Prediſpoſition* to Aſthma; and thoſe circumſtances which are ſometimes internal, but generally occur from without, are *exciting cauſes* of the fit.

The *Prediſpoſition* is of all the remote cauſes moſt important, and claims particular attention.

Hippocrates* attributes to youth a ſtate of habit ready to ſuffer hæmoptyſis, inflammations, and fever; beyond this period the conſtitution is liable to be attacked by peripneumony, lethargy and Aſthma. In advanced age difficulties of breathing, &c. come on, but this writer applies the word ασθματα to that conſtitutional affection which he aſſigns to manhood in the 30th aphoriſm, and δυσπνοιαι to that of old age in the 31ſt. And he alſo in the 26th aphoriſm includes ασθματα amongſt the affections attacking the body in the period before puberty.

The affection ſignified by ασθματα in this place is again attributed to puerile habits in another† by the ſame word.

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* Hippocrat. Fœſii. Aphor. 29, 30, 31. Lib. III. Sect. VII.

† Liber de Aere, Locis et Aquis. Fœſii, Tom. I. p. 281.

Infancy and manhood were therefore eſteemed by the father of medicine, the periods of human life prediſpoſing to this diſeaſe; old age brings a condition which is naturally leſs irritable, and therefore the habit is leſs likely to aſſume the ſtrong convulſive contractions which may attend the other ſtages, but it does not follow that the contractions of reſpiratory muſcles are not convulſive in old age; for if difficulties of breathing, or δυσπνοιαι affect the ſubject, in conſequence of exceſſive moiſture offending the lungs, we have no alternative in our conſtruction of the nature of muſcular contractions, which are convulſive when they are inordinate, or inconſiſtent with the common purpoſes of healthy reſpiration: nor can difficulty of breathing be characterized preciſely in any other manner, than by the meaſure of contractions which theſe muſcles undergo; though it may be allowed that a particular energy, which is not often to be expected in old age, is eſſential to the character of the Convulſive Aſthma of Modern Noſology, which, in this inſtance, is ſupported by the authority of the Greek Phyſician.

Men are ſaid by many writers to be more generally affected with this diſeaſe than women, which may probably be the caſe, becauſe the female ſex are not ſo much expoſed to the application of exciting cauſes.

The *Temperament* which prediſpoſes to Aſthma is the *choleric*, but it ſeems to derive its principal power in affecting the pulmonary function, from the diſorders of the firſt paſſages to which it is liable, and to the combination of muſcular relaxation with the peculiar character of its own habit.

This habit is accompanied with *Dyſpepſia* very frequently, as well as the melancholic, from which it may poſſibly be too great a refinement in practice to ſeparate it, though the learned accuracy of Dr. Gregory has well marked a diſtinction.*

Perſons of this temperament are more ſubject to accumulations of blood in the pulmonary veſſels, and to be affected by ſudden impulſes of paſſion and emotion of mind, which readily occaſion an impetus in the circulation, overpowering the contractile tone of the exhalents. They are alſo affected with too active a ſecretion of bile, which may occaſion new irritation and heat at the præcordia, as it certainly is frequently the effect of high paſſions and a luxurious life. If to this ſtate is ſuper-added Dyſpepſia, from want of exerciſe and indulgence at the table, or from the uſe of a contrary diet, conſiſting of aliment too weak and fluid, the choleric temperament will be more influenced by the exciting cauſes of Aſthma than any other, and may be more generally obſerved to be ſubject to its attacks.

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* Conſpectus Medicinæ Theoreticæ, 929.

Wherever Dyſpepſia prevails, there ſhall we find a fruitful opportunity of exciting the paroxyſm of Aſthma; but this morbid debility of the ſtomach muſt probably concur with accidental cauſes before the diſeaſe appears.

After it has long had poſſeſſion of the firſt paſſages, the proper nouriſhment of the body muſt be conſiderably impeded, and the ſolids being weak, the fluids muſt be watery and poor. The temperature of the habit is then low in both, and unfriendly to the promotion of new chemical affinities, by which oxygen and heat is imparted to the ſyſtem. A morbid ſtate is then productive of new diſorder, or it may be ſaid, that prediſpoſition is more confirmed, and more rapidly approaches the point to which it tends.

The ſtimulus of the blood will not excite the heart and arteries to vigorous action, the exhalents will not contract with healthy irritability, and an over proportion of water in the blood will make the exit of ſerum through their orifices more eaſy and copious.

Dyſpepſia is acknowledged to be a frequent cauſe of Hydropic Diatheſis; and the effuſion of ſerum into the veſiculæ of the lungs is probably preceded or followed by other dropſical effuſions, which have ſo frequently been mixed with Aſthma in hiſtories of Anaſarca.

There beſides ariſes a mechanical effect from this relaxed ſtate of the firſt paſſages, which, by impeding reſpiration, very nearly and ſuddenly induces the proximate cauſe of Aſthma. The ſtomach may be diſtended to fill a very conſiderable ſpace, which ſhould be allotted in inſpiration to the deſcent of the diaphragm: at the moment when that muſcle is excited to contract its fibres and become plane, that the veſiculæ of the lungs may be inflated with new air, the bulk of the ſtomach preſents an obſtacle to the exerciſe of this function. The progreſs of the blood to the left ſide of the heart is delayed in the pulmonary vein. The capillary orifices of the artery are dilated to relieve the turgeſcence of the branches of that veſſel, and a critical eſcape of ſerous fluid enſues. This occurs in veſſels which have coats not thin and tender, which prediſpoſes to Phthiſis, but relaxed and dilatable, which is part of the prediſpoſition to Aſthma.

By this diſtention a more extenſive inconvenience follows, of the ſame kind; other veſſels are probably compreſſed, and, as has been explained, the Aqueous Diabetes is produced. The duodenum is part of the firſt paſſages, and partaking of the debility and diſorders of the ſtomach, muſt always be included in conſiderations of the influence and pathology of Dyſpepſia;* and more remotely the whole canal ſuffers from the vices of the firſt digeſtion.

The motion of the blood is promoted both in the arteries, and in the veins, by the action of contiguous muſcles. The blood returning to the heart by the Vena Cava, and its branches is moved by the action of the heart and arteries, and alſo by the contraction of muſcles which preſs the veins. Preſſure from theſe cauſes, and ſubject by the rules of muſcular contraction to alternate relaxation, muſt determine the blood towards the heart, becauſe theſe veins are ſupplied with valves which forbid its progreſs in the contrary direction.

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* Vide Hoffman de Duodeno Multorum Malorum Cauſa, Tom. IV. p. 188.

The lymphatic veſſels more numerouſly provided with valves have their action encreaſed by the ſame cauſes. When, therefore, we conſider the deficient energy of the heart and arteries, and the irregular contraction of the viſceral muſcles, in Dyſpeptic patients, we muſt allow a very fruitful cauſe for a ſlow progreſs of blood in the returning veins, and the conſequent turgeſcence of the arteries which ſecrete the urine, or, more preciſely ſpeaking, which permit the thinner part of their contents to paſs off in quantities proportioned to the neceſſity of relief.

The Vena Cava paſſing through the Diaphragm, the free motion of that muſcle materially influences the return of the blood to the heart, and the circulation being impeded in the liver, from the langour of the veſſels which are to carry off the blood, hydropic effuſions may follow* in other cavities beſides thoſe of the lungs; accordingly we obſerve dropſy of the belly and cellular membrane to follow Aſthma from this mechanical cauſe, as well as from others that are well known.

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* Vid. Hoffman, Tom. III. ſect. II. cap. II. p. 98. necnon, Tom. iv. Conſ. et Reſp. Med. Cent. 1. Caſus XCIII.

This Dyſpeptic ſtate of the ſtomach is ſo combined with the immediate cauſe of Aſthma in a great majority of caſes, that it is difficult to ſeparate it, as a prediſpoſition or ſymptom of the diſeaſe in conſidering all. Whatever reaſoning may be adopted on the diſtinctions of ſpaſmodic, humid, or hyſteric, it will be found that none of theſe ſpecies is clearly unconnected with flatulence, which, without any certain exception, makes part of the paroxyſm, or precedes it.

But though Aſthma ſo ſeldom appears without Dyſpepſia, the latter affection frequently occurs in practice unconnected with Aſthma. Sir J. Floyer conſiders this ſtate of the ſtomach as ſecondary to the ſtate of the lungs, and not as an occaſional cauſe. The powers of digeſtion will certainly be additionally weakened whenever the habit which ſettles in Aſthma is formed, and in this view Dyſpepſia may follow Aſthma, but it has previouſly been a cauſe of the diſeaſe, which reciprocally occaſions an encreaſed debility of the ſtomach, and is itſelf exaſperated and excited into exacerbations by it.

He remarks, notwithſtanding this opinion, that " a ſhort fit is accompanied only with " wind and ſpitting, and depending on diſ- " orders in diet, &c. and this was his Aſth- " ma before it ſettled into periods."*

It is to be ſuſpected that the tyranny of 30 years under which he ſuffered, was eſtabliſhed by an improper application of remedies to reſtrain the firſt approaches. It may be alſo inferred from his reaſoning, on the neceſſity of fermentation in the ſtomach, that he had remarked the ſtrong prevalence of dyſpeptic ſymptoms in general caſes of Aſthma; but ſuch reaſoning is now ſuperſeded, and we know that if the ſtomach is not morbidly feeble it will be able to govern the food, and paſs it on before the proceſs of fermentation can take place.

The character of his diſorder may be ſeen in the following paſſage, which is quite ſufficient to prove the dyſpeptic malady to thoſe who can comprehend his meaning: " Flatulent Lympha evacuated into the ſtomach " and guts, raiſing the alimentary maſs there " into violent flatulencies, like wine over- " ſtummed, the glands of the trachea and " veſiculæ of the lungs receive part of the

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* Floyer, p. 12.

" mucilaginous, flatulent, nutritious juice, " ſeparated from the blood by the efferveſcence, " &c." It is obvious that he was diſpoſed to confound all the ſymptoms, and that he ſaw obſcurely an accumulation of lymph in the lungs, and was convinced of indigeſtion and flatus in the ſtomach, but injudiciouſly blended into one falſe theory the diſtinct affections.

The Œſophagus was found by Dr. Hales, very dilatable with a ſmall force of water or wind,* which leads to a concluſion that dyſpepſia may frequently diſtend the whole canal, and that it may be productive of wheezing where there is no obſtructing mucus in the air paſſages ſufficient to account for that ſymptom. Flatulence may force the ſides of the Œſophagus againſt the trachea, compreſſing the cavity of that pipe into a ſmaller area.

Hales attributes the vertigo of dyſpeptic patients to the occaſional cauſe of flatulent wind in the Œſophagus, compreſſing the deſcending aorta, and by this means, impelling the blood for the inſtant towards the head.

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* Statical Eſſays, Vol. 2. p. 183.

The encreaſe of bulk which an Aſthmatic occaſionally ſuſtains from his dyſpeptic complaint, is very conſiderable. It will be greater or leſs according to the aliment which has been taken, ſome ſubſtances containing a greater quantity of fixed air than others; and it is probable that in the exacerbations of the diſeaſe, digeſtion is ſo very ill performed as to permit the evolution of the whole maſs of air combined with the ſubſtance. The diſtention which may take place in ſuch caſes may be conjectured, after reflecting on the quantity of air extricated from pounded apples, which give out 48 times their own bulk.* This air in the apples muſt have been condenſed into leſs than a forty-eighth part of the ſpace it takes up when free from them. Fermentation and heat are the cauſe of its ſeparation, and theſe cauſes muſt operate after a certain delay in the ſtomach, from the debility of the organ, and the faults of quality or quantity in the gaſtric liquor. A light atmoſphere ſuddenly diſcovered by the falling of quick-ſilver in the barometer, may add to the influence of theſe cauſes by compreſſion on the ingeſta being diminiſhed, and the elaſticity of the confined air having leſs external reſiſtance made to its eruption.

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* Vide Dr. Hales' Vegetable Statics, p. 208.

Dyſpepſia may be Symptomatic or Idiopathic, but it is obvious that the Idiopathic Dyſpepſia is the diſeaſe which makes part of the prediſpoſition here aſſigned to Aſthma.—When the affection is ſymptomatic of Retrocedent or Atonic Gout, Exanthemata, or Ammenorrhæa, it may afford an obſtacle to freedom of reſpiration and circulation whilſt it continues, but the hydropic diatheſis, the relaxed ſolids and watery fluids, are not part of the conſequences of temporary dyſpepſia. The Idiopathic ariſing from a loſs of tone in the muſcular fibres of the ſtomach, may have depraved the digeſtion for any ſuppoſed length of time, and the peculiar debility, in which its own character conſiſts, will be encreaſed in proportion, and extended over the ſyſtem.

The hydropic diatheſis may follow or precede Aſthma, and is a condition leading to the effuſion in the veſiculæ in common with effuſions elſewhere. Dyſpepſia induces general debility, and this ſtate is followed by a general laxity of the exhalents, and an increaſed exhalation into every cavity and interſtice of the body. “ We have ſeen,” ſays Dr. Cullen, "effuſions of a ſerous fluid "made in the ſame time into the cavity of the "cranium, into that of the thorax and abdo-"men, and likewiſe into the cellular texture "almoſt over the whole body. In ſuch caſes "the operation of a general cauſe diſcovered "itſelf by theſe ſeveral dropſies, increaſing "in one part as they diminiſhed in another, "and this alternately in different parts."— He refers ſuch a condition to a general laxity of exhalents,* and if the effect is not diſcovered ſo often in the air cavities of the lungs as in others, this organ owes its greater ſecurity to the continued and inceſſant activity of abſorption by lymphatic veſſels, and of reſpiratory motions which aſſiſt abſorption, in removing by vapour the encreaſing fluid. We have a dependence on this combined power, in proportion to the importance of the function to be preſerved by its efforts.

In the paroxyſm the ſurface of the body is univerſally pale, and the muſcles appear ſhrunk. The weakneſs of the heart and arteries, with a prediſpoſition of their contents to the character of venous blood, becauſe oxygen is deficient, ſufficiently account for both ſymptoms. And if the Aſthmatic in the intervals of his fits preſerves the livid complexion, the prediſpoſition of the blood is ſtill to explain the appearance, and to afford prognoſtic of future acceſſions, as exciting cauſes may occur.

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* Cullen's Practice, MDCLVII.

In this ſtate of the blood of an Aſthmatic, it is not neceſſary to foreſee conſequences more fatal than uſually occur in the diſeaſe. Mr. Kite has proved, "that the left ſinus "venoſus, auricle and ventricle, do not ceaſe "to contract in conſequence of the phlogiſ"ticated ſtate of the blood in their cavities."* In Aſthma examples have been given in ſect. VII. of different degrees in the intenſity of this affection. In ſome ſubjects the great effuſion was too oppreſſive to be diſcharged from a habit of little irritability; in others, life was preſerved with difficulty, and the balance had been kept between death and recovery, with terrible uncertainty of which ſcale would finally aſcend. In theſe inſtances effuſion of ſerum had been ſudden and extenſive, excluding the further penetration of oxygen into the veſſels, but notwithſtanding, life was ſtill preſerved, till the irritability of the ſyſtem being exerted with energy, the bar was removed.

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* Mr. Kite's Eſſays and Obſervations on the ſubmerſion of Animals, &c.

An ingenious writer* very juſtly objects to the theory of fever, depending on the deficient quantity of oxygen received into the blood by inſpiration, becauſe unleſs this diminiſhed proportion is referred to the peculiar actions of the ſyſtem of the perſon afflicted, and to his corporeal mechaniſm, all perſons would be equally affected with fever, whilſt the atmoſphere, that grand magazine of oxygen, is open to the benefit of all. In ſuch a caſe the accumulation of Carbon and Hydrogen, with the conſequences ſtated, are to be regarded as effects.

This conſideration applied to Aſthma very ſufficiently confutes a doctrine attributing the diſeaſe to the deficiency of oxygen, without reference to thoſe morbid derangements of the animal œconomy, which may impede or embarraſs the abſorption of this fluid, ſo uſeful as a remedy, and whoſe abſence may add to the exciting cauſes of the phænomena, though it cannot be the proximate cauſe of their exiſtence.

The Prediſpoſition to Aſthma is neceſſarily marked by a habit from which the ſubject is affected, by apparently ſmall impreſſions on the nerve or fibre, whatever name this diſpoſition may have obtained; Mobility, Irritability, or Senſibility. The robuſt are unaffected by impulſes which the feeble or delicate may acutely feel.

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* Dr. Hamilton Obs. on the Seats and Cauſes of Diſeaſes, Vol. 1. p. 93.

This diſpoſition of the body is likewiſe more perceptible at one period of life than at another, and certainly is gradually leſs acute with the progreſs of years, and becomes almoſt loſt in extreme old age.

It is as well deſcribed by the term *Irritability* as any other. It is always marked in its degrees of acuteneſs by the habit of facility with which convulſive motions, after having been once excited, run into exceſs, or, which having ſubſided with their cauſe, are liable to return, upon much inferior occaſions, and even in ſome inſtances without a perceptible excitement.

This is a prediſpoſition, without which the ſpaſmodic contractions called Aſthma, cannot in ſome caſes be accounted for, and it ſeems to attend or precede the production of the Convulſive Aſthma from mucous irritation. This irritation may be removed, but the prediſpoſition remaining, the diſorder cannot be ſaid to be cured.

It may be ſuggeſted, that if the ſtate of the pulmonary veſiculæ in Aſthma is deſcribed with fidelity, a paralytic atony of the *Lymphatic Abſorbents* is probably a concurring cauſe of the accumulated fluid. Such a temporary debility of action in the abſorbents is not impoſſible, but the Pathologiſt muſt be unwilling to rely on the frequency of their morbid condition, becauſe Providence has, doubtleſs, placed them in the animal machine to relieve the diſorders which may occur to every other branch of the ſyſtem.

Mr. Hunter firſt ſupported the opinion, that ſolid as well as fluid bodies may be removed by abſorption, and experiments have actually aſcertained that this is fact. The energy of this claſs of veſſels is never to be diminiſhed without important injury in the habit, and if diſeaſe attacks them, it is only to be alleviated or cured by a fortunate alteration in their own tone. The arterial and venous veſſels are not proved to give aſſiſtance in any derangement of the lymphatics, though the latter may be corroborated by the ſame means as ſtrengthen the former, but effuſions from thoſe veſſels, or new and unneceſſary productions from them, are perpetually carried off, and the healthy function of the veſſels themſelves reſtored by the efforts of the lymphatics; and it is probable that no dropſy can be deemed incurable, whilſt abſorbing action is performed by a perfect organ.

If, then, we are to conſider the paralyſis of the lymphatics, as a cauſe of the accumulated fluid in the veſiculæ, and of the aqueous diabetes which attends it, we muſt ſuppoſe a condition of the abſorbing ſyſtem, which is not likely to admit of the relief which ſo periodically ſupervenes upon a paroxyſm of Aſthma. If we ſuppoſe a rupture of a lymphatic branch, we infer a fixed and local cauſe of continued dropſy; and if a ſpaſmodic conſtriction is alledged, the caſe is too uncertain and capricious to be depended upon, and may ſo commonly occur, as to ſtand in oppoſition to the deſign of the lymphatics, whoſe office is that of the laſt guardian of the ſafety of the animal œconomy. But the relaxed ſtate of the exhalents is perpetually liable, from exciting cauſes, to give out this exceſs of fluid, and we have no reſource in explaining its diminution or removal in general caſes, but the ſalutary and providential interpoſition of the power of abſorption. How efficacious this power is, the rapid removal of dropſies in ſome inſtances, and of uſeleſs bones in others, and of productions which the œconomy of nature declares to be ſuperfluous, or embarraſſing to her operations ſufficiently evince.

That the abſorbing veſſels are particularly eſſential to the preſervation of the air cavities of the lungs from obſtruction of any kind, muſt be concluded from their great number diſperſed in the pulmonary ſyſtem. "Next to the "liver," ſays Mr. Cruikſhank, "the greateſt number of abſorbents has been found "in the lungs."* Dr. Hales ſays, the velocity of the blood in the lungs, is many times greater than in moſt other parts of the body. A remora in any of the veſſels of this organ, will therefore be in proportion, more productive of uneaſineſs than in any other; and effuſion from the exhalents, or rupture of the veſſels, according to the habit of their coats, will be a conſequence of a free return of blood from the right ſide of the heart to the left being obſtructed, ſooner than in any veſſels where the velocity of the blood is leſs, though thoſe veſſels ſhould be equally obſtructed, and the number of times when ſuch conſequence occurs, muſt, in theſe circumſtances, correſpond with the ſum of velocity exceed-

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[*] Anatomy of the Abſorbents. p. 196.

ing in theſe veſſels the velocity in any other. Thus in the habit which admits its veſſels to be dilated and not ruptured, effuſion in the veſicles may perpetually demand the active abſorption of the lymphatics of the lungs, and without that natural interference being preſerved in undiminiſhed vigour, and more generally ſo, than a theory of paralytic or conſtricted lymphatics will ſupport, Aſthma muſt be a diſeaſe occurring much oftener than we find it, and much more fatal in its progreſs and reſult.

It was therefore deſigned by Providence that an abſorbing veſſel ſhould be ſtimulated into action, by the preſence of a fluid at its mouth, which it takes up by ſelection, rather than by capillary attraction.*

By this wiſe plan a lymphatic is excited to act in proportion to the quantity of ſtimulus, which irritates its appetency, and an energy is founded, which, in the pulmonary ſyſtem, is ready to be exerted for the moſt important purpoſes, and is naturally commenſurate with the diſtreſs which accumulated ſerum brings upon the organ.

The ſame aſtoniſhing proviſion for conſtitutional relief, ſeems to be attended to in the apparatus of nerves, which is furniſhed to the abſorbing veſſels with careful regard to their independent function. Theſe veſſels are not to be the ſport of every external relation, but to obey the ſilent laws of animal irritation. Their action is to commence when the heart has propelled the blood, and a continued contraction of the arteries has carried it to the extreme parts of the arterial ſyſtem. If a diſeaſed veſſel gives way to the impulſe, the fluid which paſſes out of the aperture, is drunk up by the lymphatics, and if at the very extremities the exhalent orifices are morbidly relaxed, and permit the ſerous part to be effuſed, this alſo meets the mouths of the lymphatics, and ſolicits their abſorption.

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* Mr. Cruikſhank Abſorb. Veſſels, p. 110.

But if nothing morbid occurs in the progreſs of the blood along the arteries, the veins may not perform their duty in a perfect manner, their ſides may dilate, and may become ruptured, or if an obſtruction in theſe veſſels is conſiderable, the arteries not throwing the blood with their uſual facility into their cavities, aſſume a turgid ſtate and relieve themſelves by capillary exhalation.

Here is another exciting cauſe of exertion in the abſorbing veſſels, which muſt drink up the extravaſated venous blood, or the arterial lymph, and without a permanent capacity to perform this office, the animal body would be continually ſubject to derangment. The Supreme Artiſt, therefore, conſtructed them with an appetite to be ſtimulated in meaſure equal to the irritative cauſe, but his plan excluded the influence of external ſenſation in the degree which affects the other veſſels, on whoſe motions this ſyſtem was deſigned to wait. "There is, therefore, "in the abſorbents leſs dependence on "nerves, than in the muſcles and arteries."*

When the unobſerved activity of this ſyſtem is reflected upon, and its extenſive value to the health of an animal body, it might be almoſt aſſerted that the Creator planted in the original fabric of man, one moving power, which was to be the lever which phyſicians were never to neglect to ſtudy in its conſtruction, its relations, and its force; by this, diſeaſe was to be removed, when no inſtrument which human genius could invent, was competent to effect the object, and which was to diſcover at intervals its magnitude of power, and the extreme benevolence of the Supreme Architect in giving it to the animal ſyſtem.

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* Mr. Cruikſhank's Anatom. of the Abſorb. Veſſels. p. 172.

Theſe are conſiderations which appear to render the ſuppoſition of conſtricted or ruptured lymphatics, being amongſt the remote cauſes of a paroxyſm of Aſthma, very improbable.

SECT. XII.

The Remote Cauſes *continued.—The* Exciting Cauſes.—*Alterations in the denſity of the air.—Effect of unuſual rarity.—Oxygen united to the blood in greater proportion as the preſſure of the atmoſphere encreaſes.—The rarity of the air on mountains and elevated countries.—An animal deſtroyed by exhauſtion of air.—An animal expoſed to accumulated denſity of air.—Lightneſs of air with moiſture, and with heat and moiſture.—The heat of ſummer and autumn.—Effect of evaporation from ſurfaces.—Cold.—Cold and moiſture.—Eaſterly and north eaſterly winds.—Rain, ſnow, ſtorms.—Active exerciſe in warm air.--Diſſipation of heat.--The aſthmatic months of Auguſt and September.—Froſty weather.—The advantage of froſt.—The cold bath.—Evacuations of blood.—Violent purging or vomiting.—Inanition.—Accelerated impulſe of circulation.—Suppreſſion of evacuations.—Repulſion of exanthemata and gout.—Duſt in the air.—Metallic fumes.—Smoak of Tobacco.—Smells.—Perfumes.—Fixed air.—Paſſions of the mind.—Changes of the moon.—Errors in diet.*

THE influence of the ſtate of the air, upon a nation or body of men, may not be productive of any evident effects upon their corporal habits, generally conſidered;* but changes of the atmoſphere will incontrovertibly induce alterations in the health of ſubjects prediſpoſed to particular diſeaſes, and by theſe changes they may ſuffer exacerbations, or be reſtored from their violence, and enjoy remiſſions. In all diſeaſes of diſordered reſpiration, whether febrile or not, this truth is confirmed by experience. In *pertuſſis* it is particularly remarkable, but not more ſo than in Convulſive Aſthma. Sir J. Floyer lived in Oxford twelve years, and had little diſtreſs from his complaint; but he never viſited Staffordſhire, his native air, without a ſevere paroxyſm or two. An Aſthmatic, whoſe caſe will be related, for ſeveral years after the eſtabliſhment of his diſorder, could not ſtay a day in the place of his birth and the reſidence of his childhood, and which he had viſited with impunity till the age of 30, without the ſame effect, though the cauſe of his diſeaſe was laid in a different ſituation, leſs favourable to its production.

The atmoſphere produces effects on the Aſthmatic, by ſeveral changes. When the mercury in the barometer ſtands as high as 30 inches, the denſity of the air is ſufficient, *cæteris paribus*, to preſerve the intermiſſion of his diſorder; and alterations from this ſtandard to a lower, will be according to circumſtances unfriendly. Beſides a change from this degree of denſity, the ſtate of the air may be cold or warm, cold and moiſt, or warm and moiſt; and rain, ſnow, or froſt, ſtorms, and fogs may give additional impreſſion, but ſlight in compariſon of the ſtate which occaſions their appearances.

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* Falconer's Influence of Climate.

The obſervations of Floyer on the influence of denſity, or rarity of air on the Aſthmatic, are well founded and juſt. In a denſe atmoſphere, acrid miaſmata, effluvia, and vapours are ſuſpended high, and are therefore not ſo likely to irritate the pulmonary membranes; theſe floating particles will not ſo much offend the ſubjects of mucous irritation, as others, whoſe habits are characterized with equal ſenſibility, but whoſe pulmonary membranes are more naked of natural defence from lubricating lymph.

Vapours are, however, accuſed in all ſorts of Aſthmas, without reflection on the impunity, with which many Aſthmatics inhale the atmoſphere of London and Holland. In theſe places the advantage derived from its denſity and preſſure, more than balances the inconvenience ariſing from fog, and various animated filth, never perfectly cleared away or diſſolved, but from its quantity and inceſſant ſupplies, always floating and being inſpired.

In ſituations of greater altitude, impurities of the air are a more ſenſible exciting cauſe of Aſthma, or poſſibly, it may be more accurate to ſay, that when vapours hang low in theſe ſituations, we have a certain index of the diminiſhed denſity of the air, which would otherwiſe carry them off, and that the cauſe of their low ſuſpenſion is really a ſtate of atmoſphere, producing at the ſame time the diſorder of the reſpiration.

It may be ſaid upon the ſame principle, that a dry and ſettled atmoſphere is friendly to the Aſthmatic, not only, becauſe it is free from impure vapours, but, alſo, as having more elaſticity to preſs upon the veſiculæ of the lungs.

The circumſtances of the atmoſphere render the combination of oxygen with the blood, difficult or eaſy. The ſoft and thin membrane through which it is abſorbed, has been frequently, in its natural ſtate, ſhewn to admit of the penetration of elaſtic fluids. The prediſpoſition appears in Aſthma unfriendly to their union, and changes in the atmoſphere may more materially obſtruct it.

The uſual denſity of the air being loſt, a certain volume will in proportion have leſs weight, and preſs leſs againſt the membrane, and the ſame volume will have leſs oxygen to be attracted to the new affinity. Where the heat of the body ſo much promoting the proceſs was before diminiſhed, this additional change may be a ſerious exciting cauſe of the Aſthmatic paroxyſm.

A certain quantity of oxygen is conſumed in leſs time, in the reſpiration of air which has great preſſure, than in air of little preſſure. Under the *greateſt* preſſure, which was made by an admirable chemiſt, whoſe abilities and ſucceſs in experiment have been long acknowledged, the oxygen was conſumed in leſs than half the time of the *ſmalleſt*, although the exceſs of the former above the latter, was much leſs than that which men experience in the common changes of weather.* If we reflect upon this circumſtance, we muſt conclude, poſitively, that oxygen enters the blood veſſels, contrary to the opinion of Dr. Crawford, and that preſſure conſiderably encreaſes its penetrating force.

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* See Minutes of the Society for Promoting Philoſophical Experiments and Converſation.

The objections which have been urged* to the accounts of Hæmorrhages, occaſioned by great rarity of the air on high mountains, however ingeniouſly ſupported by experiments, cannot overturn the plain fact, of conſiderable diſorder repeatedly known to be induced on the lungs by the weight of air being haſtily leſſened; though it is not to be ſuppoſed that concurrent cauſes in the habits of the perſons affected, or greater proportions of unreſpirable fluid may not occaſionally operate in theſe regions. The preſſure of external air upon the human body, is eſtimated at 32,000 pounds weight in ſome ſtates of its denſity, in other ſtates it is ſuppoſed to be reduced to half that weight.

The ſubject has been more accurately handled than is here neceſſary to ſpecify, and particularly Bouguer,† appears, with the aſſiſtance of a pendulum, to have obtained great preciſion, in calculating the encreaſe or diminution of denſity of air, according to the degrees of aſcent from the ſurface of the ſea.

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* See Dr. Darwin Phil. Tranſact. Vol. 64.

† Memoires de l'Academie, des Sciences, de 1753, p. 515.

The morbid alterations in the animal body, which are produced in conſequence, are more the object of this inquiry.

An animal killed by exhauſtion of air under the receiver of an air pump, has the right ſide of the heart and veins greatly diſtended with blood, and the left ſide almoſt empty.

An animal of equal vigour placed under a magazine of a condenſing machine, will bear an encreaſe of denſity of three or four atmoſpheres. The former animal expired in two minutes, the latter remained a quarter of an hour at a time, without any material inconvenience, and appeared to ſuffer moſt from returning to his cuſtomary medium of greater rarity.* In the firſt experiment the equilibrium was deſtroyed between the external air, and the air circulating with the fluids in a fixed ſtate, which therefore expanded. This ſtate the muſcles of inſpiration could not overcome, and the lungs being forced into a ſtate of expiration, the blood could not be paſſed to the left ſide of the heart, from the collapſe of the veſſels.

In the ſecond caſe an exceſs of air merely effected a more perfect and durable expanſion of the cavities, and thus facilitated conſiderably, the paſſage of the blood to the left ſide of the heart,* doubtleſs affording at the ſame time increaſe of vigour and ſtimulus to the actions of that organ.

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* Mr. Kite on the Submerſion of Animals, p. 50, &c.

M. de Sauſſure had experimental proof of the inconvenience to reſpiration, from great rarity of air, on the top of Mont Blanc, the mercury in the barometer at the ſame time, ſtanding at little more than half the height which it did in the plain below. Sir W. Hamilton obſerved a ſimilar difficulty of reſpiration on Mount Ætna, which he attributed to the rarity of the air, diſtinct from ſulphurous vapour. Oxygen has been found in leſs proportion, as a component of the atmoſphere in theſe high regions, than in the lower, which is an additional reaſon for diſordered reſpiration.

If to the lightneſs of the air, *moiſture* is added, the operation of its influence may be more injurious, and has frequently been felt in various ſituations, when the prediſpoſition to Aſthma was not preſent. This conſtitution of the air excited the diſorder of reſpiration, treated of by Dr. Miller, under the name of Aſthma.

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* Mr. Kite, p. 52.

Heat and moiſture appear to influence the denſity of the air, more than philoſophers had conceived, before the obſervations of M. de Sauſſure, jun. appeared.* The effect of theſe adventitious circumſtances is felt by other valetudinary ſubjects of relaxed fibre, as well as the Aſthmatic, but by none more than the latter.

In *ſummer* and *autumn* the atmoſphere is rare, and ſo far hoſtile to the Aſthmatic; but to leſſen this inconvenience, he enjoys the grateful ſenſe of a warm ſkin, and general perſpiration, by which the circulation is determined to the ſurface more than in the colder months. If it was not for this diverſion in favour of the lungs, he would perceive much more of his complaint than he really does in the warm ſeaſon, for many circumſtances operate againſt him then which do not in winter. The profuſe exhalation from the pulmonary veſſels, excited to occaſional exceſs from exerciſe or other cauſes, will more certainly take place in the hot months, and be more ſuddenly followed by the coldneſs, which is known to come upon ſurfaces, and to be conſiderable, in proportion to the internal heat and the evaporation made from them. After this coldneſs is induced upon the lungs, the atmoſpheric air will not be properly decompoſed in their cavities, the oxygen will not be abſorbed and unite with the blood, and a conſequent loſs of vigour in the contraction of the heart and arteries, will be added to the local affection. The torpor of the exhalent orifices will follow theſe cauſes, or accompany the ſtate, in conſequence of original prediſpoſition and the local impreſſion from loſs of heat. Then we have effuſion without the power of cuſtomary evaporation, which is ſuſpended in the progreſs.

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* Journal de Phyſique par M. L'Abbé Roſier, Tome XXXVI. Memoire ſur la Denſité, &c p. 98.

Dr. Ryan* takes great pains to eſtabliſh the doctrine of cold, occaſioning this diſeaſe. *Cold and Moiſture* check cutaneous perſpiration, and diminiſh the heat of the lungs, there is, therefore, additional fluid circulating to the pulmonary exhalents, and there is leſs expiration of vapour in breathing. The ſkin may even be changed from a perſpiring, to an imbibing ſtate, creating an exceſs of water in the veſſels. We have, therefore, in this ſtate of the atmoſphere, an exciting cauſe of

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* Obſervat. on the Hiſtory and Cure of the Aſthma.

Aſthma, as frequently as in moiſture with warmth. Cold alone will not uſually excite the paroxyſm, though there are ſtates of the atmoſphere inducing great torpor on the pulmonary exhalents, without the poſitive preſence of aqueous vapour, or moiſture. The *Eaſt and North Eaſt Winds* are ſo piercing, as to overcome the influence which coldneſs, ſimply united with denſity of air, would have on the reſpiration, to the advantage of the Aſthmatic. Theſe penetrating winds are felt *intus et in cute*, by all perſons of lax fibre and ſenſibility of nerve; but a froſt in itſelf is friendly to the Aſthmatic.

The eaſt and north eaſt winds, not only chill the lungs, and make their capillaries paſſive and incapable of contracting on their contents, but they check cutaneous perſpiration inducing another cauſe of Aſthma in catarrh. Why the cutaneous capillaries are conſtricted preceding their torpor, or in conſequence of it, whilſt the pulmonary capillaries are affected with torpor and dilated apertures, can only be ſatisfactorily explained by recurring to the prediſpoſition of an Aſthmatic ſubject; at the ſame time allowing the fact, that even when this prediſpoſition does not exiſt, perſpiration ſuppreſſed on the ſkin, will always find an exit from the pulmonary capillaries, or thoſe of the inteſtinal canal, unleſs an acute fever ſupervenes, from every paſſage being equally obſtructed. This is proved by the moiſt expectoration of a mild catarrh, and by gentle diarrhæa from taking cold. In the Aſthmatic ſubject fever does not readily come on, and the pulmonary veſſels having more than equal debility with thoſe of the reſt of the ſyſtem, the flux is diſcharged from them, and a torpor fixes them in the paſſive ſtate which previouſly prevailed, or renders them leſs capable of reſiſting the current of fine ſerum impelled from behind.

Changes to rain or ſnow affect the Aſthmatic, becauſe of the decreaſe of weight in the air, which gives occaſion to theſe alterations. Storms of any kind, are uſually attended with ſudden rarity of atmoſphere, and according to the prevalence of exceſſive heat or cold accompanying the change, the Aſthmatic will be more or leſs affected. Sir J. Floyer obſerves, with juſtneſs, theſe effects, but attributes too great conſequence to the influence of matters floating in the air, apparently looking at phænomena as cauſes of Aſthmatic fits, which merely follow changes in the denſity of air, as effects equally with theſe.

Active Motion in a warm air, with frequent reſpirations, produces great encreaſe of exhalation from the ſuperficial capillaries, and from the lungs. The further augmentation of heat, is by this means prevented; but this is not the only conſequence of profuſe exhalation in the Aſthmatic ſubject. The tone of his pulmonary exhalents is very weak, and the heat being ſuddenly carried off may leave them in too quieſcent a ſtate to contract upon their contents. But the general vaſcular tone, though lowered, not being reduced to the point of debility which locally affects theſe exhalents, and the *vis a tergo* being more forcible from occaſional cauſes, the ſerous part of the blood eſcapes through the enlarged apertures into the veſiculæ.

The *Diſſipation of Heat*, by this means, is productive of the moſt ſevere fits of Aſthma. Floyer had moſt returns in the hot months, and they were likewiſe the longeſt. The month of Auguſt was particularly his enemy, and I have ſeen in Auguſt and September more ſerious paroxyſms than in any other. It muſt be obſerved, that in this period of the warm ſeaſon, the condition of the body is relaxed, by the impreſſions of the heat having continued for ſeveral months, and the prediſpoſition to be influenced by this exciting cauſe, and by the great rarity of air, is much ſtronger than in the earlier months.

But heat may be carried away from the body, by other means beſides exhalation, and this effect takes place in froſty weather, but not uſually with the ſame conſequences to the Aſthmatic. A *froſty air* is more denſe, has more weight for its bulk, and contains a greater proportion of oxygen in the quantity inſpired at every inſpiration. A perſon will alſo breathe quicker in this air, and therefore takes more frequently a change into his lungs, oftener decompoſing it, inhaling oxygen, and diſcharging carbon. The influence of cold upon the capillaries would be injurious in this caſe, if not ſpeedily counteracted by the animating ſtimulus of this remedy for the beginning torpor, the weak contractions of the veſſels, and the more chronic poverty of blood*.

The effects of cold are partly exemplified, by entering a cold bath, when there is a torpor of the pulmonary capillaries from ſympathy, with the ſubcutaneous capillaries, which, of courſe, are firſt affected by the cold.* This occaſions a cold breath and quick reſpiration, and in ſome degree illuſtrates the torpor, which the pulmonary capillaries ſuſtain in Aſthma, from the influence of cold coming ſuddenly upon them. But in Aſthma, the torpor commences with the pulmonary capillaries, whilſt the ſubcutaneous are not more ſtrongly affected, than may be ſuppoſed from the prediſpoſition which had long ſubſiſted; and the heart and large veſſels have not in Aſthma a correſponding torpor, which certainly in the cold bath muſt be univerſal, that is, there muſt be univerſally in the ſanguiferous ſyſtem, leſs active contraction of veſſels during this powerful and ſudden abſtraction of heat, giving an increaſe of irritability to be excited, with more effect by the uſual ſtimulus of common heat when the cold medium is no longer applied. A torpor of the pulmonary capillaries from going into the cold bath, will not be followed by effuſion in the manner of Aſthma, becauſe the prediſpoſition may not be preſent, and if it was, the *vis a tergo* is rendered paſſive in proportion to the quieſcence of the arterial capillaries of the lungs.

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* See Dr. Crawford Exper. and Obſerv. &c. alſo Minutes of the Society for promoting Philoſophical Experiments and Converſation. Exper. &c. concerning Reſpiration.

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* See Zoonomia.

In Aſthma the *vis a tergo* does not correſpond with the debility which affects theſe capillaries.

Beſides the abſtraction of heat locally or generally inducing vaſcular quieſcence, a deficiency of other ſtimuli may occaſion the torpor. *Diſtention* is a ſtimulus which excites the actions of the whole arterial ſyſtem, and therefore the paroxyſm of Aſthma may be excited by withdrawing part of this ſtimulus.

Profuſe Bleeding, ſpontaneous or artificial, may leave the veſſels with too little ſtimulus from their contained fluids, and this deficiency of ſtimulus will be owing to the want of diſtention, and to the want of pungent quality, conferred on the fluid by the preſence of red globules and gluten. The mouths of capillary veſſels will in this caſe not contract to their healthy ſtrictneſs of diameter, and the fluid being thinner, as well as weaker, will more readily eſcape.

" Animals," ſays Dr. Hales, " when
" they are near expiring, do uſually breathe
" quick, the lungs then labouring to heave
" faſt, that the languid blood may thereby
" have a freer courſe through them, to ſupply
" the then almoſt bloodleſs pulſations of the

"heart, as was the caſe in the experiment "of the mare when her blood was near ex-"hauſted."*

When by the great evacuation of blood, the veſſels loſt their ſtimulus of diſtention, the animal fell into cold clammy ſweats, which could not happen from the protruſive force of the blood, but muſt ariſe from the relaxation of the capillary exhalents.

There is reaſon to apprehend, that an injudicious uſe of the lancet in pulmonary complaints has brought on Aſthma in ſome inſtances. I am certain of this effect in others where Dyſpeptic pain of the ſtomach was the ſuppoſed indication of pneumonic inflammation.

Violent Purging or Vomiting may be an exciting cauſe of the paroxyſm, or the acrimony of indigeſted matter in the firſt paſſages productive of thoſe evacuations, may at the ſame time, irritate the reſpiratory muſcles of the abdomen and thorax, into ſuch an exceſs of contractions as take the character of the diſeaſe. But conſidering the exhauſtion and debility occaſioned by purging, and the want of ſtimulus to the ſtomach after vomiting, the alimentary canal is left in a condition powerfully adding to the ſtate of habit, in which the prediſpoſition to Aſthma ſo much conſiſts. This artificial depletion is not leſs productive of the fit, than faſting is.

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* Hales' Statical Eſſays. Vol. II. p. 6.

The *Want of Food*, or an abſurd neglect of regular meals, will as certainly excite the paroxyſm in ſome aſthmatics, as a moderate and light ſupper of tender animal food will alleviate the diſtreſs of others, when in ſome inſtances of long eſtabliſhed complaint, the approach of the fit was plainly indicated by the feelings of the patient.

There is, therefore, a critical attention neceſſary to the calls of the ſtomach, and the power of that organ to perform digeſtion. The firſt ſhould never be neglected, and the latter never oppreſſed. If the ſtomach is loaded, the fit will be more violent, than after the occaſional cauſe of faſting.

Faſting, is not only an exciting cauſe of Aſthma, but it will, according to its extent, encreaſe the prediſpoſition to the diſeaſe, by lowering the heat of the body. Animal heat may not ſolely be dependent on the decompoſition of the air in the lungs, or, if it is, that operation is much influenced by cauſes variouſly affecting the habit, through the medium of the alimentary paſſages and otherwiſe; local inflammation raiſes the temperature of the body, but ſleep depreſſes it, and faſting inducing weakneſs, very conſiderably diminiſhes the heat.*

A ſudden *Encreaſe* in the *Impulſe* of the *Circulation* may excite the paroxyſm of Aſthma. It may be ſuppoſed that previous to the effuſion of ſerum, a gradual diſtention of the veſſels has taken place, with accumulated contents. Dyſpnœa will attend the courſe of this alteration in the tone of the veſſels, and encreaſe with the diſeaſe. When the veſſels are no longer dilatable, they will be ruptured, or effuſe by their capillary branches their ſerous fluid. Exciting cauſes will accelerate this event, and rapid or violent bodily motion by impelling the blood ſuddenly to the lungs is one cauſe.

Sir J. Floyer places amongſt the cauſes of the Continued Aſthma, the "ſtraining of "the lungs by running." Though his explication of the ſtraining does not apply to the condition of the blood veſſels, and their contents, but to the fibres "betwixt the lobes

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* See Mr. J. Hunter, on Animals producing Heat, alſo Dr. Percival's Eſſays, Vol. II. on Famine.

" of the bladders," which he ſeems to ſuppoſe affected, as if they conſtituted a part of the locomotive muſcles, we may accept his practical fact, without aſſenting to his reaſoning.

Upon the *Suppreſſion* of the *Hæmorrhoidal* or *Menſtrual Flux*, a ſubject diſpoſed to pulmonary accumulation of blood, or to weak and dilatable veſſels may ſuffer Dyſpnœa, or a paroxyſm of Aſthma, according to the extent of diſeaſe and prediſpoſition. A reſtoration or promotion of the ſuſpended diſcharge removes the difficult reſpiration.

The ſame may be ſaid of *Repelled Eruptions* or *Gout*, but cauſes of this kind excite the regular convulſive paroxyſm, only in perſons who have before ſuſtained it. If the breathing is affected from thoſe exciting cauſes, when Dyſpepſia and the Aſthmatic habit is not eſtabliſhed, the affection may be rather called Dyſpnœa, or if attended with fever, pneumonia or peripneumony.

The Membrane of the air pipes of the lungs is defended more conſiderably from the acrid particles floating in the air, in the ſpecies of Aſthma now under our conſideration, than in the natural ſtate where this diſeaſe is abſent.

But the pulmonary ſyſtem of an Aſthmatic is at all times very irritable, from the repetition of paroxyſms, which it has ſuſtained, and ſlight offences will therefore induce a fit.

Duſt of any kind is an exciting cauſe. Hair powder has been obſerved in many inſtances to bring on firſt ſneezing, then by aſſociation of muſcles a more extenſive ſyſtem of powers are put in action, to eject the inconvenience, which may, poſſibly, have only touched ſome points of the trachea uncovered by mucus.*

Metallic Fumes are very pungent, and will ſhew their effect on an Aſthmatic by exciting a paroxyſm.

The *Smoak of Tobacco* is in moſt caſes offenſive to the Aſthmatic, and even when the habit of inhaling the fume is purſued, and abſurdly thought to be a remedy for the diſeaſe, the patient, by inſpiring the qualities which are conſtantly being ejected in natural reſpiration, oppoſes the deſires of the animal œconomy, and ſtrengthens the prediſpoſition to this diſeaſe. It is affirmed that ſmoakers are Aſthmatic, and Diemerbroeck found their lungs dark coloured, approaching to black, and ulcerated.†

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* See Floyer's Treatiſe, p. 74, &c. † Diemerbroeck. Lib.II.p.444.

Sir J. Floyer mentions a patient, who ſmoaked to cure a pain in the ſtomach, and by this means acquired the Aſthma.

Fetid Smells are ſometimes cauſes of the fit, but not often, unleſs groſs particles not diſſolved, but diffuſed in the air, are received into the trachea.

Strong Perfumes, generally acknowledged ſweet, are as likely to excite a paroxyſm as fetid ſmells. They all phlogiſticate the air, to a ſmall degree, and though the eudiometrical experiments of M. Achard prove no conſiderable injury from the mixture of theſe fumes with common air, the ſenſible membrane of the trachea and bronchia of an Aſthmatic, is a teſt which frequently ſuperſedes all reaſoning from philoſophy.*

The *Aerial Carbonic Acid* is an exciting cauſe recorded by Sir J. Floyer. I have known the inſpiring of the vapour of fermenting ſubſtances in brewing, to be followed immediately by the paroxyſm.

This air, or inflammable air, acts in a more perfect expoſure by deſtroying ſenſibility and irritability. Anticipating by ſtrong impreſſion the reaction of the powers of life to eject its influence. See *Memoires par M. Portal. Sur Les Effes Des Vapeurs, Mephitiques dans L'Homme.**

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* See Journalde Phyſique, Tome 26. De L'Effet Des Parfums Sur L'Air.

The *Paſſions* of the mind may excite a paroxyſm, or ſtrengthen the prediſpoſition to it.

Anger ſhews its effects on the circulation whenever it occurs. The fluids ſeparated from the blood, are determined to their excretories in greater haſte, and in larger quantity. Hence a redundancy of ſaliva, and of bile, and a ſtraitneſs in breathing are not uncommonly the reſult of an impetuous ſally of anger. The Dyſpeptic diſpoſition is ſtill more certainly encreaſed. *Joy* encreaſes the vigour of the heart and arteries, and may therefore impel the circulation before circumſtances have allowed a reſtoration of contractile power to the capillary exhalents of the lungs, their orifices may then let the ſerum eſcape. *Love*, *Grief*, *Terror*, appear to diſtreſs the mind and relax the habit, they may not in this view ſo frequently excite the paroxyſm, as they may add to the prediſpoſition which leads to it.

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*Hiſtoire de L'Academie Royale des Sciences, Annee, 1787.

The Aſthmatic is ill calculated for the exerciſe of *Venereal Pleaſures*, however he may be prompted by ſenſation or taſte to purſue this indulgence. Gratification not uncommonly excites the paroxyſm.

Severe Study affects the digeſtive powers, and therefore promotes prediſpoſition. The ſedentary life which literary men purſue very probably is the intervening means of producing a morbid ſtate. Study, conſidered in itſelf, can ſcarcely be thought injurious. Ardent thinking, attended by the occaſional ſatisfaction of uſeful diſcovery, and the hope of reputation, may animate the body, and invigorate the mind, but theſe advantages are more than balanced by encreaſing diſorder of the firſt paſſages, from want of exerciſe ſo neceſſary to the periſtaltic action of the inteſtinal tube.*

If the *Changes* of the *Moon* ever influence the motions in animal bodies, they may be ſuppoſed with great reaſon to excite the paroxyſm of Aſthma. It appears that the attractions of the ſun and moon at ſome periods combine their powers, and influence the gravity of bodies with greater effect. Theſe united powers are calculated by Sir I. Newton, not to exceed one 7,868,850th part of the force of gravitation: and yet this comparatively ſmall power can raiſe the tides at the equator above ten feet high. If the lunar influence produces a ſmall degree of quieſcence at firſt, and if that recurs at certain periods, even with leſs power to produce quieſcence, yet the effect will daily encreaſe by the acquired habit acting at the ſame time. The quieſcence may commence at any hour when co-operating with other cauſes, it becomes great enough to produce a diſeaſe. Afterwards it may continue to recur at the ſame period of the lunar or ſolar influence. The ſame cauſes operating with the acquired habit, that is, with the catenation of this new motion with the diſſevered links of the lunar or ſolar circles of animal action.

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* See Tiſſot De La Santé Des Gens De Lettres.

The periodical returns of Aſthmatic paroxyſm, dependent on a quieſcent ſtate of the capillary exhalents of the lungs, claim attention from the phyſician to theſe probably exciting cauſes; but the ſubject is yet involved in principles ſo difficult of application to the fluctuating phænomena of diſeaſe, that I cannot affect to inform from perſonal obſervation. The ingenuity of the author of Zoonomia has rendered probability to conjecture. He is the only writer who gives any ſatisfaction to the curious inquirer on this obſcure ſubject, and who has ever countenanced the Hippocratic doctrine of critical days, by the ſupport of reaſons derived ~~from~~ natural facts. See Zoonomia, Vol. I. XXXII. 3.

Errors in Diet are a copious ſource of inconvenience to the Aſthmatic, as may be expected from conſidering the Dyſpeptic condition attending his diſorder, and radically united to its cauſe. Under this head may be ſpecified, drinking too much of ſtrong liquors, or liquors full of carbonic acid, with aceſcent materials in the compoſition, ſweet wines and new beer. Profuſe indulgence in the uſe of tea, and warm watery liquids of all kinds; theſe are exciting cauſes of Aſthma. Heavy ſuppers, eating between meals, and generally, all food of difficult digeſtion, may produce the ſame effect; ſuch are ſmoaked meats, paſtry, fat pork or beef, water foul, raw vegetables, ſallads and unripe fruits, alſo boiled cabbage and carrots, rich ſoups, jellies, and ſauces. Theſe alimentary ſubſtances are not readily governed by the ſtomach of an

Aſthmatic, but remain till a fermenting proceſs takes place, and if purging or vomiting brings no relief, the paroxyſm may be excited ; even when theſe evacuations occur the conſequence is not often prevented. Every thing which in Dyſpepſia ought to be avoided, ſhould be abſtained from by the Aſthmatic, who muſt rigidly believe that his paroxyſms may be more frequent, or the intermiſſions longer, according as the ſeductions of the table are too powerful for his prudence, or are reſiſted by his care. Intoxication, and ſurfeit are ſo conſpicuous amongſt the worſt of his enemies, and have ſo little allurement where the habit is infirm, that an Aſthmatic is not to be ſuſpected of ſuffering from the excitement of theſe groſs errors.

Our INQUIRY into the cauſes of Convulſive Aſthma, ſuch as it will be found in practice nine times in ten, has now embraced diſorders of reſpiration which have been acknowledged to follow obſtructions in the pulmonary ſyſtem, by all pathologiſts, or which have been proved to proceed from the immediate oppreſſion of extravaſated ſerum in the preceding ſections.

In examining the remaining varieties of this diſeaſe, we leave a ſcene of ſenſible appearances, and approach the ground where our path is not ſo plain, and the object of our inquiry more obſcure. But analogy is ſtill diſtinct, and we have aſcertained ſome fundamental laws of the animal œconomy, which beſtow no inconſiderable light upon its relations.

SECT. XIII.

Second ſpecies of Convulſive Aſthma from the irritation of acrid effluvia in the lungs.—*Diagnoſtics of this ſpecies.—The Remote Cauſes.—Condition of the mucous membrane.—The nature and effects of effluvia.—Odours.—Inſtance of a convaleſcent from the diſeaſe of Mucous Irritation.—Deductions.*

THE *Second Species of Irritation*, ſeated in the pulmonary organ, and immediately cauſing a paroxyſm of Aſthma, is the *Acrid or Offenſive Quality* of ſome unobſerved matter, conveyed by the air, and attached in the act of inſpiration to the ſenſible membrane lining, the tracheal and bronchial pipes. This may be connected with the cauſes explained in the preceding ſections, but it may alſo be unconnected with *ſenſible bulk*, and yet equally excite the *Motus Medicati* to diſlodge it, creating a form of Aſthma treated of by Noſologiſts with as much obſcurity as they attribute to its origin. But the *Niſus* of nature, immediately following the irritation of this extraneous ſubtle matter, it may juſtly be ſaid to embody the proximate cauſe of the diſeaſe.

This form of Aſthma is to be diſtinguiſhed by the abſence of copious expectoration, and ſometimes there is no expectoration at all, particularly when the complaint goes off abruptly and ſoon, for then the offence is probably removed by change of air and ſtrong expirations.

If the fit continues long, the irritation produces an encreaſed action in the excretories of the mucous membrane of the bronchia, and expectoration will be the conſequence, but when this expectoration takes place the ſymptoms will generally ſubſide, becauſe the irritating cauſe becomes inveloped in mucus, unleſs the habit has arrived at that acute ſtate of morbid ſenſibility, in conſequence of which, convulſive motions are likely to remain, and return at intervals, the original excitement of them being removed. Wheezing is not a ſymptom, unleſs the long continuance of the fit ſhould induce a ſecretion of mucus ſufficient to ſtraiten the bronchial paſſages. The Aqueous Diabetes is alſo abſent, but the action of the intercoſtal and the abdominal muſcles, is the ſame as in other varieties of diſordered reſpiration. Whether a ſpaſmodic conſtriction of the bronchia takes place or not, I am entirely ignorant, for reaſons before delivered.

In attributing Aſthma of this kind to irritation, I reaſon entirely from analogy, which informs me that the muſcular motions which take place, indicate an offence in the lungs, and as this offence is not apparent to the ſenſes, I prefer probable conjecture in reaſoning on the few inſtances which this ſpecies offers, to deranging the induction eſtabliſhed in a great majority of caſes of Convulſive Aſthma, by aſſigning to ſimilar effects cauſes diſſimilar.

The Prediſpoſition to this ſpecies conſiſts in a habit more ſenſible of ſlight offence than is common in the Aſthma from mucous irritation. The hydropic diatheſis is never preſent, and frequently the tone of the veſſels of the lungs is not weak. Some turgeſcence of blood may appear in the face, and bleeding, if not poſitively uſeful, is not commonly injurious. Dyſpepſia accompanies the attack, but not with violence. The peculiar mark of prediſpoſition to be attended to, is the morbid ſenſibility or irritability of the body, perpetually ſuſceptible of ſpaſmodic muſcular contraction from inferior cauſes of offence; this habit is more liable to pulmonary irritation, from the dryneſs of the Schneiderian membrane, which in this ſpecies is a Remote Cauſe.

Many authors diſtinguiſh this diſorder, by calling it the *Dry Aſthma.* Etmuller particularly makes *Wheezing* the diagnoſtic, which, by being abſent or preſent, points out the *humid* or the *dry*.* They all allow ſome little mucus to be ſpit up in the latter, but the line which they have drawn takes too many caſes from the ſpecies before treated of, and enlarges the liſt of the preſent, more than experience will be able to defend.

We muſt recollect, that mucus may be more or leſs ſeparated, according to the ſtate of the ſyſtem. The glands, or ſimple capillary exhalents are too relaxed in one ſtate, and the diſcharge is copious and occaſionally oppreſſive, but this condition of the pulmonary membranes, however inconvenient, is not very liable to irritation, from miaſmata floating in the air, which would be a cauſe of additional diſtreſs to the reſpiratory function. The ſenſible membrane of the trachea is defended by the mucous coat from the attack of aerial acrimony, as far as the condition of the body, varying, notwithſtanding in ſenſibility to external impreſſions, will admit of this defence. Other things being equal, this guard is efficient in a very important degree, and complies with the purpoſe for which it was deſigned.

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* Vide Opera, Tom. I. Cap. XIII. p. 176.

But if there is a deficient ſecretion of lymph upon the membrane of theſe air pipes, and abſorbing power is active, its ſurface will want the lubricating moiſture, which in a better ſtate would have defended it. In this caſe, irritation may offend it by a thouſand imperceptible points which the air conveys in the act of inſpiration.

It is ſaid, that then a perpetual dry cough, inflammation, and hoarſeneſs follow,* but theſe unequivocal ſymptoms of phthiſis do not conſtantly attend. A more ambiguous ſtate may prevail, which inclines to Aſthma, though the danger of phthiſis will always be conſiderable, if ſituation expoſes the patient to the repeated or permanent application of the irritating cauſes.

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* Obſervat. on Phthiſis, by W. White, M. D. p. 63.

As to the matter of irritation it is too ſubtle for analyſis, but we conjecture that it is diffuſed in the air. *Effluvia* iſſue from bodies of the denſeſt texture, and are diſcovered by the odour of all aromatic ſubſtances. Dr. Liſter found a number of ſtones, which had been laid in drawers made of Barbadoes cedar, thickly covered with a liquid roſin, like Venice turpentine, though no manner of exudation appeared in any part of the cabinet. He concluded, that all the turpentine of the cedar wood had been carried into the air, and then condenſed into its fixed ſtate upon the ſtones. And that all odoriferous bodies ſpend their very ſubſtance in effluvia.*

The magnetic and electric influences depend upon ſtill more ſubtle effluvia, whoſe activity is ſufficiently known by its effects.

The aſtoniſhing diviſibility of matter admits of proof to an extent which vindicates the inference of effluvia conſiſting of ſuſpended particles.

Mr. Boyle ſhews an inſtance of the diviſibility of one grain of copper, and proves that this portion of matter imparted a conſpicuous colour to above 256,806 times its bulk of water; a manifeſt tincture to above 385,200, and a faint, but diſcernable colour to above 530,620 times its bulk of water.* What then may be expected from the ſolvent qualities of the air, or from its capacity of ſerving as a medium of diviſion of the particles diffuſed in it?

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* See Philoſoph. Tranſact. No. 110. p. 224.

The influence of odours upon different people will be varied according to an idioſyncracy which determines them to be agreeable or not. Muſk is offenſive to many, whilſt others delight in its effluvia. Mr. Boyle gives many inſtances of the effect of odours on the ſenſations of man, and when it is proved that ſuch odours are offenſive, there can be little heſitation in admitting the probability of their inducing Aſthma, when the body has the prediſpoſition before ſtated to aſſume the paroxyſm of that diſeaſe. It can alſo be readily allowed that particles not qualified to affect the ſenſations, may operate upon the irritability of an Aſthmatic, by giving an offence to the pulmonary function. Or they may be received in a ſtate ſo very diluted that the membranes may not ſuffer from their impreſſion, until by accumulation and mutual attraction they may aſſume a more condenſed and ſubſtantial form; and by their pungency become ſuddenly offenſive in the lungs.

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* The Hon. Mr. Boyle's Works by Dr. Shaw, Vol. I. p. 409.

Influence of this kind is moſt prevalent in populous or manufacturing places. There are perſons whoſe ſenſibility of impreſſion immediately excites a cough upon their entering a town. And others ſuſtain a more extenſive reaction of muſcular contraction in the paroxyſm of Convulſive Aſthma, if they come out of the pure air of the country and ſleep in a town. The greater or leſs preſſure of the atmoſphere modifying, to more or leſs advantage, this inconvenience.

The ſimpleſt caſe of reaction in the pulmonary ſyſtem is that of expiration by cough, and the reſiſtance of the trachea by ſhutting of the glottis to the entrance of further acrimony: this is exhibited in acute energy when an animal is expoſed to breathe unreſpirable air. His expirations exhauſt the lungs of good air, but nature oppoſes the repleniſhing them with bad.

If the irritating matter is too ſubtle for obſervation, it may be excreted in the vapour of expiration, as it was received without immediate perception of its inconvenience in inſpiration.

Many of the exciting cauſes of the paroxyſm in the laſt ſpecies of Aſthma may be here conſidered as proximate, becauſe they induce no intervening irritation more near to the actual ſymptoms than themſelves.

When effluvia fall upon the pulmonary membrane, the irritation of the particles will be more extenſive and more ſenſibly felt according to its ſtate of dryneſs. But in proportion as the general habit is firm, and little diſpoſed to that condition which is popularly called *nervous*, though the local irritation is acute, the inordinate contractions of the reſpiratory muſcles will be leſs readily excited. If on the contrary the habit has been acquired of muſcular convulſion, by frequent aſſociation of reſpiratory muſcles and frequent repetition of an irritating cauſe, the Aſthmatic paroxyſm may much more probably ſupervene, upon the milder effort to eject an acrid particle by ſneezing or cough.

When an Aſthmatic is convaleſcent from the diſeaſe of mucous irritation, he is very liable to be the ſubject of this variety. The abſorbing ſyſtem is put into additional activity by the plan of cure which, it will appear, is the only ſucceſsful one in treating that ſpecies. The habit of the Aſthmatic is generally ſtrengthened, and the morbid laxity of the pulmonary exhalents conſiderably removed. There is, therefore, leſs danger of effuſion, and greater abſorbing action, according as the progreſs of the cure proceeds; but the *ſenſibility* of the pulmonary ſyſtem is not reduced to a healthy ſtandard, and the *force of habit* is yet to be overcome. The irritation of effluvia on the pulmonary membrane may therefore excite the uſual muſcular contractions to eject an offence, and will ſooner produce this effect upon the reſpiratory function of a perſon ſo recovering than when it was defended by the lymph covering its membranes, becauſe fortunately the irritations of mucous and aerial acrimony do not readily come into action at the ſame time.

I have had frequent experience of this fact; particularly in an Aſthmatic reſtored from the ſtate deſcribed in the preceding ſections, whoſe Schneiderian membrane became unuſually dry as the cure proceeded, and was even affected with frequent inflammation. The fluctuating qualities of the air frequently irritating this membrane, occaſionally produced a paroxyſm without expectoration, until the habit of relapſe was conquered by the means purſued.

In the preceding ſections it was eſtabliſhed, that the convulſive actions in Aſthma proceeded from the immediate irritation of ſome *bulky obſtruction* in the lungs, and in the preſent ſection analogy ſhews that the ſame effect may be cauſed by the irritation of *acrimony*, always preſent in the atmoſphere in greater or leſs degree, and ready to be inſpired.

I am, therefore, at liberty to adopt the poſition formerly aſſumed, as a deduction from reaſoning, analogy and facts, that "*Certain Inordinate Contractions of the reſpiratory muſcles indicate the preſence of a matter offending the pulmonary organ by its oppreſſive bulk, or acrid quality, or both.*"

SECT. XIV.

Inquiry, *if the immediate cauſe of Convulſive Aſthma may be extraneous to the thoracic cavity.—Aſſociation and ſympathy of muſcles.—The final cauſe and indication of ſympathies.—The muſcles of reſpiration are ſubſervient to the functions of ſeveral organs in the abdominal cavity.—Their aſſociated contractions indicate perceptions of offence to thoſe organs.—Convulſive Aſthma is occaſioned by* Irritation in the Abdominal Viſcera.—*Inſtances of this cauſe.—General Deduction.*

WE ſhall now inquire, whether this convulſive diſorder of the reſpiratory muscles may proceed from irritation in any other part of the œconomy, as has been aſſerted? Circumſtances defend the concluſion of theſe actions having been excited in ſome inſtances by irritation, external to the thoracic cavity, but it cannot be made to appear with certainty, that the irritation of extravaſated ſerum, or of aerial acrimony, was not preſent in the lungs at the ſame time. The former irritation might be removed by the unobſerved power of abſorption; and the latter might be carried off imperceptibly in the vapour of expiration.

It ſtill remains probable, that in ſome caſes the offending cauſe is ſeated in part of the viſcera below the diaphragm.

We are obliged to recognize a law of the animal œconomy which has been before appealed to.* A Sympathetic Aſſociation of muſcular contractions is known to take place, when the fibre of one muſcle is irritated. In this manner teneſmus brings on ſtrong periſtaltic action of the whole inteſtinal canal, and alſo of the abdominal muſcles and diaphragm. This affection of the rectum is alſo excited when the upper part of the canal is alone primarily irritated; it proceeds alſo, as well as ſtrangury, from inflammation of the uterus. A ſtrangury and teneſmus mutually occaſion each other. Theſe are ſympathetic affections of parts nearly contiguous, but aſſociation of actions is ſtill more extenſive.

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* See Sect. II.

An irritation of the neck of the bladder, or extremity of the rectum was obſerved by Dr. Whytt, to be the cauſe of a conſtant contraction of the Diaphragm and abdominal muſcles.* When the uterus is irritated by inflammation or pregnancy the firſt paſſages are much diſordered, and vomiting is frequently excited. In labour, the moſt violent contractions of the abdominal muſcles and diaphragm take place, in other words the muſcles ſubſervient to reſpiration are excited with great energy, and powerfully aſſiſt in delivering the organ from its burden.

In reaſoning upon ſympathies, Dr. Whytt oppoſes the opinion, that theſe affections are occaſioned by anaſtomoſis of nervous branches; and gives examples of more conſiſtent ſympathies, which, on this theory, might be expected to take place, but which do not uſually appear. It may be demanded, if the difficulty is removed by referring all inſtances of conſent of parts to the common ſenſory, without tracing the deſign of the ſeveral motions? Doubtleſs, whatever be the origin of extraordinary ſympathies, the *final cauſe* is the good of the animal œconomy.—This may not clearly be diſtinguiſhed in the progreſs of ſymptoms perpetually accumulating upon the diagnoſtic indication of primary offence. Error and obſtinacy, the pride of ſyſtem, and the influence of authority, have conſpired, in too many inſtances, to obſcure the plaineſt indications of nature, till her operations become too complicated for the moſt ſagacious experience to unravel.

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* See Whytt on the Vital and Involuntary Motions. Alſo his Obſervations on Nervous Diſeaſes, p. 26, &c.

Dr. Whytt diſcovers, in the ſympathies which he enumerates, ſome that are marked with a *Wiſe Intention.* He inſtances the contractions of the abdominal muſcles and diaphragm in teneſmus, ſtrangury and labour; in ſneezing, coughing, and the hiccup; and the "increaſed motion of the organs of reſpira-"tion in the fit of an Aſthma, they are," ſays he, "the efforts of nature to free the body of *ſomething hurtful.*"*

The "*Wiſe Intention*" of all the ſympathies may ſome time be elucidated. Thoſe muſcles which ſerve the function of reſpiration, are never excited to extraordinary contractions, without affording to the conſiderate obſerver the indication of ſomething hurtful, which is now offending, or which has offended, an organ in the thorax or abdomen, which it was the natural buſineſs of an individual muſcle, or the ſet with which it aſſociates, to endeavour to diſcharge by ſome emunctory.

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* Sympathy of the Nerves, p. 72.

After an attentive conſideration of the experiments and deductions of men of ſuperior ſcience, it will appear ſafeſt to admit the inference, that *Senſation* and *Irritation* are diſtinct properties of the living animal. It has been proved, very ſatisfactorily, that certain inſtinctive actions, calculated to avert injury or pain, may be independent of nervous influence, and are exerted without the intervention of the ſenſorium commune.*

But though this diſtinction, pointed out by Gliſſon, enforced by Baron Haller, and acceded to ſince by the beſt authorities in phyſiology, is defined upon juſt grounds of experiment, it does not follow that the influence of ſenſation may not be communicated from the nerves, in which it is inherent, to the muſcular fibres, though the latter may proceed to contract without ſuch a medium of ſtimulus.

If inſtinctive actions are therefore performed by the muſcles, without nervous excitement, they are alſo performed in conſequence of that excitement, and their contractions take place without the poſſibility, in general inſtances, of diſtinguiſhing where the ſtimulus was firſt applied, on the muſcular fibre or on the nervous filament; but in addition to this general preſumption, it is proved, that the contraction of a muſcle may be excited by irritating the nerve leading to it, whilſt the nerve itſelf is unaffected.

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* Vide Croonian Lecture on Muſcular Motion, by Dr. Blane, p. 36, &c.

We have thus obtained a certainty of the influence of the nerves on the muſcular fibre, and it is of little importance to know if this influence is mutual; every purpoſe of practice is anſwered by the aſſent to this poſition, that the *ſentient extremities* of the nerves, and the *moving* or *muſcular fibres* have an eſſential correſpondence, ſo ſtrict as to induce the opinion of ſome phyſiologiſts that they are extenſions of the ſame nervous medulla.* The ſentient nerve gives the fact of exciting contractions, and correſponding by ſympathy, with diſtant parts. The muſcular fibre is ſuſceptible of the excitement of the *vis nervoſa*, and it is alſo irritable by ſtimulus in conſequence of the *vis inſita*.

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* Vide Dr. Cullen, Inſtitutions of Medicine, alſo Boerhaave, Inſtit. p. 395.

The objections advanced by Profeſſor Monro,* to the independence of the vis inſita, are ſupported by experiments which appear to leave the queſtion exactly on that footing, and no otherwiſe invalidate the concluſions of Haller, deduced from the poſitive irritability of the heart, after a perfect ſeparation from the body.

It is not, therefore, proved, that a neceſſity exiſts of always applying to the cerebellum to obtain thoſe motions which exhibit a " wiſe intention" of relieving an organ from ſomething hurtful.

Theſe ſalutary actions are, in common inſtances, excited without conſciouſneſs but of the general effect to be produced; ſuch are ſneezing, coughing, and laborious reſpiration, belonging to the pulmonary organ. Vomiting, and diſcharging feces belonging to the alimentary canal, and paſſing urine, an action of the bladder; in all theſe motions, though unconſciouſly excited, the muſcles of the cheſt and abdomen are active inſtruments.

Mr. Hunter † takes notice of the analogy between coughing and vomiting; in the former the lungs are paſſive, in the latter the ſtomach is not neceſſarily active, as the powers of the diaphragm and abdominal muſcles are competent to empty the ſtomach as well as the rectum.* The muſcles of reſpiration are the active inſtruments of emptying the lungs, and the ſame muſcles are aſſiſtant in evacuating the lower viſcera. This natural alliance of powers frequently comes into exertion, when their union would not be neceſſary to produce the effect deſired. In violent coughing to diſcharge extraneous matter from the lungs, the ſtomach is compreſſed, and the diaphragms coming into action, vomiting is brought on. On the contrary, acrimony in the ſtomach and duodenum excites the aſſociated efforts of the reſpiratory muſcles, which act by ſympathy, as if the cauſe of offence peculiarly diſturbed the lungs.†

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* Obſervat. on the Nervous Syſtem, Chap. XXVII. alſo Dr. Smith's Tentamen Inaugurale, p. 45.

† Vide Obſervations on Digeſtion, p. 200.

The author of Zoonomia looks beyond theſe natural catenations of muſcular motions, and is deſirous of finding more remote connections of cauſe and effect, than I apprehend can be ſupported by the teſtimony of experience.

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* This was alſo the opinion of the French Phyſicians, but it has been confuted by the Experiments of Mr. Haighton. See Mem. Med. Soc. Vol. II.

† Vide Willis de Morbis Convulſivis, Vol. I. Chap. xii.

After many difficulties in arranging the theory of Aſthma, he concludes, ſummarily, that the Humoral Aſthma has but one remote cauſe, which is the torpor of the pulmonary veſſels, or the want of abſorption of the pulmonary lymphatics. And that the Convulſive Aſthma is like other convulſions, or epilepſies, "and may be occaſioned by pain in "almoſt any remote part of the ſyſtem."

He is more confirmed in his opinion from knowing an inſtance of one lady, whoſe Aſthma ceaſed, on her being afflicted with pain, and gouty ſwellings of her large joints. A young man was alſo ſeized with Aſthma from the retroceſſion of eruptions on his face.

The laborious reſpiration of infants in teething is alſo ſtated to be the Aſthma Convulſivum exerted to relieve pain.

In adults, the author gives no example of the ſuppoſed pain being ſeated farther from the lungs than the liver, or biliary ducts. And the relief by pain being transferred from the trunk of the body to the limbs, with a ceſſation of Aſthma in conſequence, muſt be admitted as evidence of the diſeaſe being occaſioned by a cauſe ſeated in the trunk of the body, if the fact is appealed to.

The teething of infants may produce quick reſpiration, but has the obſerving Phyſician remarked that it was then unaccompanied by fever, or diſorder of the firſt paſſages? Pyrexia diſtinguiſhes it from the Convulſive Aſthma of adults; and an affection of the ſtomach and bowels, almoſt conſtantly attending dentition, permits the inference that ſpaſmodic reſpiration may be intended to remove that uneaſineſs.*

Has any practitioner obſerved Convulſive Aſthma to be excited, as is *Tetanus*, by a prick of the toe? It is natural to believe that where the lungs ſhew no indiſpoſition, and where no mucus is excreted in the progreſs of the complaint, an inconvenience may have been oppreſſive in thoſe other viſcera whoſe functions are ſerved by the muſcles which are excited to extraordinary contractions. The intercoſtals, the diaphragm, and the abdominal muſcles are the common property of all the middle and lower viſcera, and diſcover their uſes when fæces of the blood are to be expelled from the lungs in mucus, or in the aerial form of carbonic acid and vapour; when acrimony is to be expelled from the ſtomach by vomit; when excrement is to be diſcharged from the bowels, and urine from the bladder, or a ſtone from the kidneys, ureters or bladder;

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* See Zoonomia, Vol. II. III. I. I. 10.

and when extraneous fluid or fœtal production is to be propelled from the uterus. Should ſomething hurtful be lodged in any of theſe organs, the muſcles we have mentioned may naturally aſſociate their motions, and the indications are not obſcure; until there is good evidence of a more remote ſeat of the immediate cauſe of Aſthma, it is unphiloſophical and uſeleſs to deſert theſe limits.*

In the firſt part of this Inquiry there are inſtances of diſordered reſpiration from cauſes ſituated in the abdominal viſcera, and though the form of diſeaſe which they aſſume is generally that of Continued Aſthma or Dyſpnœa, exacerbations may be often periodically marked, and are the encreaſed *motus medicati* exerciſed with unavailing effort to diſcharge the offence.

When theſe permanent and mechanical cauſes do not exiſt, the paroxyſm may aſſume its regular form from the immediate irritation of a temporary offence in parts below the diaphragm, eſpecially the hollow muſcles.

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* A very curious caſe of Convulſive Cough is recorded by Dr. Whytt, ariſing, ſeemingly, from conſent with the ſenſations of the lower extremities, but the reſpiration in Aſthma is performed by a complicated aſſociation of muſcles, of which a cauſe ſimilar to that of the Convulſive Cough is not yet known.

The relief which is ſometimes obtained by vomiting or purging, affords evidence that acrimony in the *ſtomach or bowels* was a cauſe of the Convulſive Aſthma. But the example is not to be confided in where the paroxyſm does not totally ſubſide in conſequece. If the convulſive reſpiration clearly goes off we have conſiderable proof that in theſe inſtances, which are, however, very few, no other acrimony or offence excited the actions than what was ſeated in theſe paſſages. If, on the contrary, the paroxyſm does not entirely ſubſide, we muſt remain in doubt, or by a prudent compariſon of ſymptoms, decide, whether the remaining motions are the actions of *habit*, or excited by irritation in ſome other organ. The neceſſity of ſuch deliberation too often occurs in practice, and according to the ſagacity of the phyſician, great credit may be obtained by unexpected relief given by antiſpaſmodics, or patience muſt be ſtill exerciſed in waiting for expectoration, or ſome other diſcharge.

Irritations of different organs, doubtleſs, frequently occur together, but the *ſtomach and duodenum* are their principal ſeats. Floyer does not reſt upon the principles here delivered, but he gives hiſtories confirming the fact, in himſelf and others. No writer has before applied theſe muſcular motions to the natural purpoſe which, in Aſthma, ought to embrace them, but inſtances of great diſorder of the firſt paſſages or *biliary ducts* may be noticed in their remarks. Dr. Ferriar* gives the caſe of a lady whoſe paroxyſm terminated with ſickneſs and vomiting. Millar gives theſe evacuations, or the diſcharge of wind, as the critical relief in the diſeaſe which he deſcribed.

Willis ſpeaks of Aſthma from ſympathy ariſing from a ſtone in the gall bladder.

Hoffman has caſes of the ſame kind.†

I have met with ſeveral in which diſorder of the ſtomach was only indicated: a lady was affected with orthopnœa and great diſtreſs every night; ſhe had an inveterate acidity and inflation of the ſtomach. The reſpiratory motions were truly aſthmatic, but the ſymptoms all diſappeared upon a return of healthy digeſtion, which had been diſturbed in this violent manner by an unhappineſs in her family, and was reſtored when the ſecret cauſe of uneaſineſs was removed:

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* Med. Hiſt. &c. Vol. II.

† De Aſthmate Convulſivo, Obſ. 2. 4.

ſhe had, however, frequently diſgharged from her ſtomach, acid or bilious matters with relief.

The *Hyſteric Aſthma* is, probably, generated from the ſame ſtate of the firſt paſſages in many inſtances, and if attended with wheezing, this ſymptom is readily explained by the great diſtention of the Œſophagus and conſequent preſſure of the trachea.

An Aſthmatic at 16 years of age parted with a conſiderable quantity of aſcarides and ſome round worms, and had no fit for two years afterwards.*

A ſtone found in the *kidney* of an Aſthmatic, recorded by Ruyſch, might add to the force of pulmonary irritation exciting the diſeaſe.

The *uterus* may be the ſeat of acrimony or ſtimulus of diſtention, which, I have no doubt, ſometimes occaſion Aſthma, and are frequently added to its cauſes. Females, who are of conſtitutions peculiarly irritable, and ſtill more if they have ſuſtained dyſpnœa, may readily fall into the paroxyſm at the period of menſtruation, when the uterus is turgid with blood, creating a perception of ſomething to be diſcharged. In ſuch an inſtance can any effort be more natural than that of the very muſcles which are ſo often employed in propelling ſubſtances from the uterine cavity?

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* Under the care of Dr. Thos. Bree, who related to me the fact.

The hyſteric lady in Floyer began to ſuffer Aſthma at the age of fourteen. Diſtreſs of mind is deſcribed as a remote cauſe. Dyſpepſia followed, and acrimony of the ſtomach, with a particular condition of the uterus might unite, in immediately producing a paroxyſm.

Dr. Wainwright knew a lady who had a fit every time her menſes flowed, and was worſe for all medicines for ſeven years, but afterwards had relief.*

Aſthma, from irritation in the uterus, is probably liable to be carried into exceſſive convulſions when the acrimony is permanent and continually inciting the *Motus Medicati* without relief. It appears from the following hiſtory, that in theſe circumſtances epilepſy may ſupervene. A young perſon, ill of the Aſthma, was unexpectedly attacked with epilepſy. The fits of this diſeaſe returned frequently in the day, and almoſt every day for ſeveral months, and no cauſe could be diſcovered ſufficient to produce theſe effects. "At laſt excruciating pains "in making water overcame the particular

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* Mechanical Account of the Non-naturals, &c. p. 14.

" falſe delicacy, and obliged her to diſcloſe " their ſource, which was an acrid diſcharge, " excoriating the vagina, proceeding from a " diſeaſed uterus."*

The communications of nerves may be mentioned, as very probably connecting many of the ſympathetic aſſociations excited by irritation in theſe viſcera, but I am ſatisfied with the cloſe analogies of apparent facts, without launching farther into conjecture than experience and obſervation may juſtify.

It has appeared in the preceding ſections, that Convulſive Aſthma is cauſed by irritation in the lungs of aerial or groſs offence. I now appeal to the conſiderations in the preſent ſection, and believe they will ſupport a *General Deduction* from the whole. *Convulſive Aſthma is cauſed by Irritation in ſome part of the Thoracic, or Abdominal Viſcera.*

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* Conſiderations, &c. by Dr. Beddoes and Mr. Watt, Part IV. and V. p. 89.

SECT. XV.

The Conſequences *of Convulſive Motions.--Convulſive Aſthma remaining after the Irritation is removed.—The influence of Habit.—Repetition of morbid motions, ariſing from ſenſation and perceptions of the mind.—Fever counteracts the principle of habit.—Inſtances of mental impreſſion operating upon the body and inducing morbid motions.—Ideas of relation.—The Hyſteric Aſthma.—Inference from the whole..*

WHATEVER may be the origin of a convulſive diſorder, a certain conſequence of repeated exacerbations will be an encreaſed mobility or ſenſibility of the moving muſcles. Aſthma is particularly attended by this inconvenience, which may operate to a renewal of the paroxyſm, after the proximate cauſe is removed, whether it be embodied in mucus or effluvia irritating the lungs, or in any noxious matter hurting an organ of the lower viſcera.

Convulſive Aſthma may, therefore, appear in force without any adequate and apparent irritation to excite it. This ſurpriſing phænomenon is dependent on original principles by which the animal œconomy is materially regulated, and which may be referred to the influence of *Habit*, and *Perceptions* or *Ideas* of the mind operating upon the motions of the body, connected with habit.

The original motions may probably be excited by *Irritation* only, or that inſtinctive perception of injury which is immediately followed by the reaction of the ſyſtem. *Senſation* has been ſtated to be a diſtinct property of the living fibre, but it is capable of attending, or being introduced by *Irritation.*

Here we are conſidering that advanced ſtage of Aſthma, when one paroxyſm or more has been ſuſtained. And we are to aſſent to the poſition which the preceding conſiderations have eſtabliſhed, that the diſeaſe is always occaſioned in its firſt attack by irritation of matter more or leſs ſubtle. We muſt, in fact, grant, that it would not have exiſted without this immediate cauſe.

Habit conſiſts in that encreaſed facility with which a voluntary muſcle repeats a motion which it had before performed; and it is owing to habit that a muſcle acts ſo readily with other muſcles with which it had been before aſſociated, and that it is called into action by *ſenſations* which its contractions had before accompanied.*

If irritation, then, excites the *primary* motions, the repetition of theſe muſt have ſome cauſe, excluſive of habit, which is a prediſpoſition to *ſecondary* motions.

This cauſe is *Senſation*, which appears to unite its influence to that of irritation, producing repeated actions, and ſtrengthening the prediſpoſition to them in the following manner.

Every ſenſation is accompanied by a perception of the mind, and a chain of connected perceptions being called up in the mind, conſtitutes memory. Theſe perceptions then make parts of the ſame complex idea, and have, by frequent repetition, a ſtrong relation. Aſſociations of this nature are more or leſs faithfully preſerved, according to the circumſtances of repetition of the parts, of the intereſt they excite, and the habit of the body.

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* See Dr. Blane's Croonian Lecture,

Seeing and *Hearing* are exerciſed in combination with all perceptions, and they become ſigns of the ſenſations which excited them. When the memory or imagination renews the ideas of ſeeing or hearing, they may alſo renew the perceptions aſſociated with them. With theſe perceptions are aſſociated their relations; and finally, with theſe connecting links are renewed pleaſure or pain, which had before attached to the ſenſations: and thus may be reproduced the very emotions of mind, or the muſcular contractions of the body, which ſuch ſenſations had before excited.

In this view, repetition of muſcular convulſion is not always obſcure in its principles. It has its cauſes proximate and remote, which, though not material, may excite the morbid motions of animal fibres by the operations of the mind.

The extraordinary recurrence of morbid actions from the primary perception of injury, may therefore readily take place, if pyrexia does not prevent the repetition. In caſes of thoſe poiſons which produce febrile affections, an inſenſibility of their future ſtimulus is commonly conferred with the diſeaſe,* and becomes eſtabliſhed againſt a ſecond attack, but in caſes of organic irritation not producing fever by its ſpecific quality, as in Aſthma, the organ will be more ſuſceptible of repetition of motions, the oftener they have been performed; and this from the influence of ſenſation, as well as very inferior, and ſeemingly inadequate cauſes of irritation.

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* Vide Profeſſor Cullen's Inſtitutions. LXX. &c.

When *Phthiſis* has ſupervened upon Aſthma, the purulent fever obliterates the impreſſions of habit, and the paroxyſm of reſpiratory labour is not preſerved in periods. Its actions are found to be calmed, and to ſubſide into moderate dyſpnœa.

In conformity to theſe principles of the animal œconomy, an irritative cauſe may have diſturbed the function of the lungs, or lower viſcera, and, by the operations of the ſyſtem, no longer preſerve its ſeat; but the *motus medicati* of the muſcles may return at intervals, though the exciting ſtimulus is removed. An affection of the mind may have concurred with organic irritation when the paroxyſm of Aſthma was firſt produced, and the continuance of ſuch a ſtate of mental impreſſion will render the body ſtill more liable to thoſe muſcular contractions which had aroſe out of material irritation, became catenated with the accidental trains of ideas which circumſtances introduced when the body ſuſtained its influence, and which will then be recalled by the force of ſenſation, the original offence no longer having influence, and the combination with it abſolutely diſſevered.

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* As in Small Pox and Meaſles.

Again, pneumonic inflammation may have left an indirect debility of the capillaries of the lungs, which may, for a time, ſeparate an exceſs of ſerous fluid in the veſiculæ, but, becoming gradually reſtored to their contractile tone, this ſtate of the veſiculæ may only for one day have excited the motions which are conſequent to the irritation of their cavities. But during this ſhort paroxyſm a train of ideas may have been occaſioned by the circumſtances of the patient, which recurring with violent ſenſations at intervals, will introduce thoſe animal motions with which they had caſually been united at a former viſitation.

Aſthmatic paroxyſms, from ſuch a train of impreſſions, have taken place in many ſubjects where convaleſcence was much advanced, and the primary cauſe, after a conſiderate balance of all the circumſtances, was not ſuſpected to exiſt.

Operations of the animal œconomy derived from ordinary cauſes of greater ſimplicity will explain the ſubject more clearly.

The diſcharge of urine, or alvine feces, is frequently attended with certain ideas, which become linked to the animal motions excited by the ſtimulus of diſtention in the hollow muſcles of the bladder and inteſtines. A propenſity to theſe evacuations may afterwards regularly recur at particular periods, when the attendant ideas, excited by time or place, introduce the connected ſenſations of thoſe diſcharges; and the abdominal muſcles, and diaphragm, and the bladder, are excited to contract and expel the contents, though the ſtimulus of diſtention is, in fact, not preſent, but by habit, not only is the contraction of the external muſcles induced by aſſociation with connected ideas, but the periſtaltic motions are brought to obey the new rule of the œconomy, and urine becomes ſecreted againſt the arrival of the period.

The effect of repeated emetics is well known: The ſtomach is rendered more irritable by the repetition; and the ideas connected with the nauſea excited by the medicine, very frequently induce the nauſea without its aſſiſtance. The ſight of a phial, or of a liquid, with which the emetic operation had been promoted, by raiſing their correſpondent ideas, led to the very impreſſion of the primary link, and excited the very contractions of muſcles which empty the ſtomach, and ſtill further, the aſſociated contractions of other muſcles, which, according to the uſages of the animal œconomy, had before acted in combination of effort for other purpoſes.

The influence of ideas of relation, which circumſtances have connected with a particular impreſſion, is too well aſcertained to be doubted. The ſenſation of terror has induced ſyncope, or epilepſy, or hyſteria. The object which had excited that ſenſation may not only renew the affection which it induced, whenever its appearance is renewed, but the connected circumſtances may induce their correſpondent ideas, and the impreſſions thus linked in the mind by aſſociation, will become a train of ſenſations, the individual parts of which ſucceſſively introduce each other. When this aſſociation is eſtabliſhed, the ſame animal motions may be repeated from apparent diſſimilar cauſes, but theſe are remote cauſes of the immediate ſenſation inducing the diſeaſe.

A lady had been thrown into a paroxyſm of terror by a footpad, and for the firſt time ſuſtained a ſeries of hyſteric fits. Her conſtitution became feeble and acutely ſenſible. The hyſteric affection recurred on ſmaller occaſions of alarm for many years afterwards, but more particularly was excited by the renewal of ſlight circumſtances which referred to the attack, though entirely diſtinct from the outrage. After the interval of three years, during which ſhe had diverſified her impreſſions in a diſtant neighbourhood, ſhe paſſed in a carriage along the road, and by the ſpot where the aſſault was made, and affected by the chain of ideas and her attention to them, ſhe relapſed into ſtrong convulſions.

A worthy woman had been long ſubject to dyſpeptic complaints and irregular ſecretions of bile. She married at 25 years of age, and after having been much at her eaſe, found it at length neceſſary to employ herſelf in buſineſs, and attend with great care to an encreaſing family. Theſe attentions happened to create conſiderable trouble and fatigue on Sundays. On this day ſhe gradually became more and more indiſpoſed with Hemicrania, but on the other ſix days had her uſual health. After the interval of ten years, the head ache was aggravated, and began to affect her earlier by a few hours, but did not ceaſe ſooner than was uſual. In this form the intermittent diſeaſe continued for ſeveral years, evidently excited by the additional anxiety and fatigue of one day in the week.

Her ſituation was again altered, the day of fatigue became a day of reſt, and improvement of circumſtances diminiſhed general anxiety. It might be ſuppoſed, that the Hemicrania would be loſt with the impreſſions which brought it on, but I am informed that it ſtill regularly recurs at its former periods, being linked with ideas of relation that ſtill ariſe from external circumſtances. It is probable, that a complete change of reſidence, and loſing the impreſſions of Sunday, or placing them in another day, might vanquiſh the force of habit, which is only now ſupported by perceptions connected with original ſenſations.

The caſe of Hyſteric Aſthma in Floyer,* was probably introduced by ſympathy of the reſpiratory muſcles, with that diſorder of the ſtomach which ſo frequently takes place from ſtrong affections of the mind. Affliction, at the critical age of fourteen, threw the lady into hyſteria. Dyſpepſia accompanied her agitation of mind, and the acrimony of the firſt paſſages which naturally follows the diſturbance of digeſtion, would ſtimulate the coats of the ſtomach; that viſcus would be diſtended with flatus and impede the deſcent of the diaphragm. The branches of the eighth pair of nerves would communicate ſenſations of inconvenience to the pulmonary ſyſtem, and the muſcles ſubſervient to its function were drawn into aſſociation, and a paroxyſm of Aſthma was formed.

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* Floyer, p. 17.

It is not difficult to conceive, that theſe contractions of the reſpiratory muſcles may be ſubject to recur, when the habit of their aſſociations had been once eſtabliſhed. Slight cauſes of organic irritation might draw on the convulſive efforts, fruitleſs, but in conſiſtency with the laws of animal life. The ſame trains of ideas, which in the firſt attack of hyſteria, had met with a particular condition of the uterus at the age of 14, and combined at that period to bring on the convulſive affection of the ſtomach, œſophagus, and reſpiratory muſcles, would occaſionally revive on future accidents, and be followed by the catenated motions to which habit and repetition would contribute facility.

Thus are many cauſes apparently loſt, though their effects are continued in the diſeaſes which they produced. Habit, or the frequent repetition of morbid motions rendering the body liable to a more ready recurrence of thoſe motions, according as the ideas annexed to them, by ſurrounding circumſtances, lead to the ſenſation which is the primary cauſe. The revolutions of ſeaſons, the diurnal changes of day and night, the hours of reſt and activity, the hours of meals, the objects of pleaſure or pain, the connections of friendſhip, or buſineſs, become united with the motions of the mind, and body, and thus aſſociated, morbid actions are revived, according to their ſituation in the general chain of links.

All this is well known, but like many other parts of knowledge, the reſult of common obſervation, the impreſſion has been ſuperficial, and too much neglected in practice.*

But all phyſicians have acknowledged the ſtrength of indications afforded by habit in the diſeaſe of chin-cough. Here every part of the uſual plan of life and diet, is directed to be changed. A new air is particularly requiſite, without attention to the ſtandard of its purity; and by thus counteracting the former perceptions, the diſeaſe will frequently vaniſh without the continuance of medicine.

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* In Zoonomia, there are rules by which the influence of mind on the actions of the body, are to be aſcertained, with greater preciſion, than could be expected in ſo obſcure a ſubject.

In epilepſy, a diſeaſe obſerving periods, like Aſthma, Hippocrates directs a total change in the manner of life, that former habits may loſe their influence.

In Aſthma, if in any diſorder, a ſimilar alteration ought to be enforced, and, as will appear in the practice, the judgement of the Phyſician will be defended by the event.

We have now taken a view of Aſthma, under all the forms in which it has been ſaid to appear. We ſhall obtain a more diſtinct direction to a cure of the diſorder, if a new arrangement of ſpecies is ſet out on the baſis of inferences from this Inquiry. A plan which I propoſe with greater confidence, becauſe I can experimentally affirm, that indications ariſing from each ſpecies, are really anſwered with ſucceſs in practice, and if they are followed with attention, Convulſive Aſthma will not be included, any longer, in the liſt of *Incurable Diſeaſes*.

DISORDERED RESPIRATION unattended by Fever, may be divided into ASTHMA, *Continued* and *Periodic.*

Continued Aſthma can not properly be ſaid to be free from Convulſive Contractions of the reſpiratory muſcles, but theſe are carried on without regular paroxyſms. They are more permanent but leſs violent, and depend upon fixed Irritation, Abdominal or Thoracic.

Periodic Aſthma, diſcovered in regular paroxyſms of more acute energy, and therefore uſually called *Convulſive*, which term we adopt as deſcribing its character, and ſtill complying with general cuſtom.

CONVULSIVE ASTHMA:

1ſt Species, from Pulmonic Irritation of Effuſed Serum.

2nd Species, from Pulmonic Irritation of Aerial Acrimony.

3rd Species, from Abdominal Irritation in the Stomach, Uterus, or other Viſcera.

4th Species, Secondary and dependent upon *Habit*, after Irritation is removed from the Thoracic, or Abdominal Viſcera.

Theſe are the Species to which I ſhall refer, in the laſt part of this *Practical Inquiry*.

Practical Inquiry

ON

DISORDERED RESPIRATION.

PART III.

PART III.

The PRACTICE in ASTHMA.

SECT. XVI.

The Cure of Convulſive Aſthma attempted.—Indications ariſing from the diſtinctions of ſpecies.—The Paroxyſm, including exacerbations.—In what the cure of Aſthma conſiſts.—Remedies tried.—Cathartics.—Emetics.—Diaphoretics.—Bleedings.—Diuretics.—Iſſues.—Antiſpaſmodics.—Expectorants.—Bliſters.—Inhaling of Vapours.—Oxygen.—Hydrogen.—Stomachics.—Abſorbents.—Stimulants.—Bathing—Tonics.

AFTER a full conſideration of the preceding ſections, and the comprehenſive inductions which they afford, it will not be expected that, in attempting the cure of Aſthma, I ſhall confine myſelf to the lines which have been marked out on hypothetical grounds by former writers.

A Profeſſor, who directed the opinions which ſtill influence the practice of medicine, and whoſe authority concentrates the theories, real or ſuppoſed, of former teachers, exhibits no encouraging aſpect to cheer the expectant pupil, or confirm the experienced ſtudent in the truth of the aſſigned cauſe of this diſeaſe.

" As it is ſeldom," ſays Dr. Cullen, " that an Aſthma has been entirely cured, I " therefore cannot propoſe any method of " cure which experience has approved as ge- " nerally ſucceſsful." He, however, ſtates the diſeaſe " to admit of alleviation in ſeve- " ral reſpects from the uſe of remedies, and " he makes it his buſineſs to offer ſome re- " marks upon the choice and uſe of the re- " medies which have been commonly em- " ployed in caſes of Aſthma."*

Cullen particularly attended to the authority of Floyer, adapting the theories of that author, as well as he could, to the pattern of orthodox, which he propoſed to eſtabliſh in the ſchools of medicine, and forcing the ſyſtem of Willis to conform itſelf to the faſhion which he adopted.

But was the extraordinary ſucceſs of Floyer, in treating the diſeaſe the inducement which influenced the profeſſor? It is not to be ſuppoſed, that after complaining of the tyranny of the Aſthma in his own perſon for thirty years, Floyer could attract a conviction of the truth of his theory, or much applauſe for the ſucceſs of his practice.

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* Cullen's Practice, MCCCLXXXVII.

It is time that other indications ſhould be purſued than thoſe of relieving ſpaſmodic conſtrictions of the bronchia and effervеſcences of the blood, or let us rather become empirics, and take the chance of benefit from caſual experiment, and the happy ſucceſs of blunder, than rely on directions which confeſſedly do not point to the object of our wiſhes, and may poſſibly lead us to error.

The author of this Inquiry had, unfortunately, a very particular inducement to obtain light in the treatment of Aſthma. He was himſelf the object of its attacks, and might poſſibly have had a proſpect of complaining as long as Floyer did of its tyranny, if a determined reſolution to deviate from the common path of practice had not occaſionally yielded inſtruction, and given a baſis for further experiment. In this progreſs, the *Juvantia* and *Lædentia*, elucidated, in an important degree, the indications which were before obſcurely ſeen. He was, however, in the courſe of theſe trials, too often the victim of ill founded theories, to give credit to the pathology which they ſupported. Deſpair on the one ſide was ſucceeded by more animating proſpects on the other, and he can finally affirm, that the doctrines arranged in the preceeding ſections, were digeſted from conviction of experience in the effect of remedies, as well as from primary or ſecondary indications afforded by the phænomena, and a careful compariſon of analogies.

He had obſerved the ſerous effuſion in the veſiculæ of an Aſthmatic in the year 1786, but he was not led to a concluſion of the diſeaſe being occaſioned by irritation of that kind in general inſtances, till perſonal inconvenience, ariſing from the diſorder, had excited him to examine the forms of it under all circumſtances and every influence. He was impreſſed by the ſalutary caution which Celſus gives of not miſtaking effects for cauſes, and had not previouſly reflected on the degrees in which effuſion might take place, but conſidered the appearance as evidence only of the termination of a violent diſorder, and the immediate occaſion of death.

At length a further conſideration of this diſſection, which he had recorded, prompted him to act with more deciſion in oppoſing the prediſpoſition by tonic medicines. He afterwards extended his inference from this evidence, and having the alliance of analogy and the laws of animal life, he took the convulſive contractions for indications of this irritating offence, which he found might exiſt in more or leſs quantity, according to the extent and prevalence of remote cauſes.

His ſatisfaction was ſtill more perfect, when he afterwards found that the ſame *principle* of irritation might occaſion the diſorder in ſpecies of Aſthma where mucus did not appear, and when practice continued to anſwer with great ſucceſs to the indications which he had conſulted. I may, therefore, claim, in favor of the doctrines of the preceeding ſections, the ſupport of practical authority, and I ſhall endeavour to condenſe the remainder of this inquiry as cloſely as I can, requeſting the reader to conſider the inferences and ſpecies propoſed in the former part, as marks to guide his medical walk, which have not been ſet up without mature attention to the force of remedies which they naturally point out in Aſthma.

From the year 1787, I have examined the forms of Aſthma with encreaſed induſtry, and have been ſupplied with more numerous opportunities of trying the force of remedies in the paroxyſm, than can generally occur in a practice of ten years, where the motives for inquiry are leſs perſonal to the phyſician.

I have, in conſequence, a collection of experiments, made in 130 paroxyſms, which, unleſs I could diſcern the advantage of a particular detail, I conſider too numerous to introduce here. The reader will be better ſatisfied by a general account of ſucceſs where it has been found.

A Paroxyſm of Convulſive Aſthma, is that ſtate of the diſeaſe which has an *Exacerbation* at night as long as it laſts. When the intermiſſion takes place, Aſthma is not cured, and though the paroxyſm is generally attended by at leaſt *Three Exacerbations*, it ſometimes is extended through many more, nor is there any certain limit to their number. If it does not embrace ſo many as three, benefit may be ſaid to be derived from ſome operation of art or nature, when the patient has a confirmed prediſpoſition to the diſorder, but we can never aſſent to the propriety of claiming an advantage over the paroxyſm, if the exacerbations are renewed as often as was cuſtomary in former fits, or oftener than three times if the diſeaſe is new. Much leſs can the word *Cure* be admitted to cloſe the phyſician's labour, or enhance the character of his ſagacity, unleſs an entire change in the habit of his patient, comprehending vigorous digeſtion, and eaſy reſpiration, ſhould be well eſtabliſhed after the paroxyſm has been long overcome.

The cure of the Convulſive Aſthma is, therefore, to be only attempted with ſucceſs, during the intervals of the fits. But the paroxyſm may be alleviated, and whoever has experienced its agony, will allow the value of the ſmalleſt improvement in treating it.

We ſhall curſorily notice different remedies propoſed or tried in Aſthma, pointing out the treatment which may moſt generally be adopted to relieve or ſhorten the paroxyſm. And afterwards recommend, upon experience, a plan of *Cure*, which may be illuſtrated by a few examples, aſſigned to the ſeveral ſpecies of the diſeaſe.

CATHARTICS, conſidered generally, are injurious in caſes of Convulſive Aſthma, from irritation in the lungs. If this claſs of medicine is ever uſeful, it muſt be in that ſpecies in which the irritation is ſeated in the firſt paſſages, but even here, the practitioner muſt not forget the prediſpoſition to every form of this diſeaſe, in which laxity of fibre, or morbid ſenſibility are predominant. There may be complicated caſes in which a mixture of ſymptoms leaves the propriety of purging in more doubt. But there are inſtances of purging bringing on a paroxyſm, and we can, therefore, not recommend any evacuation but the mildeſt, with the intent of diſcharging the corrupted remains of indigeſted matters from the firſt paſſages.

Purging has been ſuggeſted as a means of promoting abſorption: if ever it can be employed in this intention, without inducing greater inconvenience than it will remove, the ſtate muſt be that of Dyſpnœa, when the veſſels are turgid, but have not yet relieved themſelves by ſerous effuſion: This ſtate comes neareſt to the ſecond ſpecies of Convulſive Aſthma, but in this I have not ſeen purging of any advantage.

A bolus, compoſed of Calomel gr. iii. Antimon. Tartariſat. gr. i. Pulv. Jalapii gr. xx. was taken when the *terrentia* of the paroxyſm had made their attack. And a ſimilar medicine was taken in another paroxyſm in the height of an exacerbation, by the author, who was affected with Convulſive Aſthma of the firſt ſpecies. The paroxyſm was not ſuſpended or alleviated in either inſtance, but it was certainly prolonged in the laſt.

Emetics.—Immediate relief has been given by vomiting, and this happens generally in caſes of Aſthma wherever the irritation may exiſt. But it is particularly uſeful when the firſt paſſages are loaded with indigeſted matter, ſo frequently exciting the paroxyſm in the firſt ſpecies, or acting as the immediate cauſe of it in the third.

Nauſeating doſes of emetics are advantageous in the three firſt ſpecies, as they determine the fluids to the ſurface of the body, and relieve the lungs or abdominal viſcera; they promote abſorption of extravaſated ſerum, and exhalation from the lungs, and are powerful expectorants.

Etmuller and Baglivi recommend vomits, and Floyer approves of the operation once a month; but a repetition at regular periods is to be condemned, if the phyſician does not deſire to introduce into the habit a new rule of ſecretion.

Other writers oppoſe emetics as dangerous in the paroxyſm, but violent vomiting is not ſuggeſted, and the gentler motions of nauſea with ſlight puking, are more likely to determine from the lungs, than to encreaſe the flow of humours to that organ, as is very juſtly enforced by Dr. Foart Simmons, in treating of Phthiſis.

If the ſubject is uncommonly vigorous for an Aſthmatic, and occaſionally in the ſecond ſpecies of the complaint, tartar emetic, or antimonial wine may be given. In other caſes, ſmall doſes of ipecac. are to be preferred. I have, in ſeveral inſtances, excited ſtrong vomiting at the approach of the fit. R. B. took five grains of Tartariſed Antimony when the paroxyſm had juſt commenced. After violent evacuations upwards and downwards, with great preſent diſtreſs, the paroxyſm was lengthened by ſeveral exacerbations more than he before ſuſtained. Greater weakneſs in the intermiſſion, and night ſweats, were, beſides, the conſequence for ſeveral days.

DIAPHORETICS.—Neutral ſaline medicines are given with advantage during the fit of the firſt ſpecies, and alſo of the ſecond. In the third ſpecies they are often uſeful.

In the laſt they are manifeſtly hurtful.—Whenever they are uſed, the intention is to promote a gentle diaphoreſis, but not ſweating, which is always injurious, and particularly ſo if forced by heating ſudorifics.

Bleeding.—Many doubts occur on the propriety of bleeding in Aſthma, in any ſpecies of the diſeaſe. Before the pulmonary veſſels have attempted to relieve themſelves by their exhaling orifices, blood may poſſibly be drawn with advantage, but when effuſion has taken place, a certain debility is indicated, and a loſs of contractile power in the coats of the veſſels, which prudence will rather ſubmit to during the fit, and attempt to remedy in the intermiſſion. In this ſtate of the diſeaſe, nature purſues the path beſt adapted to her circumſtances; the eſcape of ſerous fluid gradually relieves the veſſels, and reſpiration and abſorption muſt be relied on, with a ſalutary cough, to clear the air cells of the lymph. If evacuations of blood are directed, the ſudden depletion of the veſſels will leave their coats without the ſtimulus neceſſary to produce a contraction, equal to the ſpace which the blood had occupied; the heart will participate in the injury, and will alſo be deficient in vigour of contraction. If, therefore, blood is to be taken, it ſhould be drawn from the veſſels at intervals, and in ſmall portions, which would allow of the contractile power being exerted, in proportion as the veſſel loſes its contents, and would not finally take ſo much fluid away, as would leave it without the ſtimulus of diſtention, ſo eſſential to its return of health.

But bleeding is an imprudent operation in every ſpecies of Aſthma, unleſs it be the ſecond. In the firſt ſpecies I have repeatedly directed it, but have never had reaſon to think that the paroxyſm was ſhortened an hour by the loſs of blood, and I have often been convinced that expectoration was delayed, and more dyſpnœa remained in the intermiſſion, than was common after former paroxyſms. In old people who have been uſed to the diſorder, it is certainly injurious. In the ſecond ſpecies there are occaſional topical inflammations, which this operation may relieve, but if it is carried far, there is the ſtrongeſt reaſon to apprehend, that the patient may be plunged into Aſthma of the firſt ſpecies.

I believe bleeding has never been ſuggeſted as proper, during the intermiſſion of uncomplicated Aſthma.

Diuretics.—Whether the great flow of watery urine from the kidneys is a critical diſcharge to relieve the lungs in the firſt ſpecies of Aſthma, or not, I have never ſeen the paroxyſm ſhortened by encreaſing it. The diabetes is alſo a ſymptom in the third ſpecies, and can be explained only from the ſtate of the firſt paſſages, which has been deſcribed.[*]

Notwithſtanding theſe doubts, diuretics have been recommended in Aſthma by phyſicians, antient and modern. Celſus[†] ſays, " profunt etiam, quæcunque urinam movent."

Hoffman's opinion is thus explained " In " ſtatu cachectico, cui jungitur Aſthma magnam opem ferre deprehenduntur diuretica."[‡] Rhodius[§] aſſerts, that after the ſpeedy diſcharge of thirty-ſeven pints of urine, the diſeaſe was cured. Baglivi ſays, " pluries adnotavimus, in pectoris morbis, " ſemper ducendum eſſe ad vias urinæ, natura id monſtrante.[¶]

" As diuretics and quickſilver," ſays a writer of ingenuity, " have been famed for " their ſervice in the Aſthma, have we not

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[*] Sect. X. [†] Celſus, Lib. IV. Cap. 4.

[‡] Tom. III. Sect. II. Cap. 2. [§] Lib. III. Obs. 27.

[¶] Baglivi, Obs. p. 103.

“ reaſon to ſuſpect that an anaſarca, ſo obſe-
“ quious to theſe remedies, is often the foun-
“ dation of the Aſthma.”*

Floyer ſays ſwelled legs and copious urine are beneficial changes in the Aſthma.

Whatever ſpecies of Aſthma may be alluded to in theſe accounts of benefit from diuretics, I cannot think that any critical diſcharge is ſo uſeful as by expectoration in the firſt ſpecies. And we are to avoid impeding that event when diuretics are given; ſquill and vinegar coincide in both intentions.

In experiments with digitalis, I have proceeded to a doſe which induced ſymptoms well known by practitioners to mark the propriety of diſcontinuing its uſe, but I have not ſeen benefit from the exhibition. The general tone of the body is not ſufficiently low to admit of efficacy from this powerful herb, and expectoration would be impeded by its active operation.

If urine is ſmall in quantity and high coloured, ſaline diuretics ſhould be given, and mercurials are alſo then uſefully combined, as the caſe is probably complicated with viſceral obſtructions.

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* Edin. Med. Eſſays. Vol. II. p. 326.

ISSUES.—The antients had always in view the ſerous defluxions in this diſorder, and endeavoured to intercept them deſcending from the head. This was the indication followed in the cruel practice of Ætius, who had ſo little ceremony in uſing the cautery as to direct fourteen ulcers to be made and kept open at once, between the head and the diaphragm.

In very old Aſthmatics, iſſues are ſometimes neceſſary. When the diſeaſe is not inveterate, they may occaſionally be uſeful, by diverting aqueous humour from the lungs, and giving a better opportunity for the operation of tonic remedies.

When the diſeaſe is complicated with general dropſy, I have ſeen great advantage to the breathing, from their application in the thighs.

ANTISPASMODICS.—Antiſpaſmodic medicines have no certain efficacy in ſhortening the paroxyſm of the firſt ſpecies of this diſeaſe. Exceptions may be made to this general remark, but they are not founded upon preciſe lines of diſtinction of the different ſpecies.

In the fourth ſpecies, which often appears in Aſthmatics, who may alſo be ſubjected to exciting cauſes, occaſioning one or other of the three former, antiſpaſmodics will not deceive the phyſician. Opium ſtands firſt, but its value is frequently enhanced by the addition of Æther. If theſe valuable medicines had been applied with proper diſcrimination of different ſpecies of Aſthma, the practice would not have been ſo frequently diſgraced by failure in the expectations of relief from their uſes.

Calcined Zinc, which has been ſtrongly recommended, has been found in many trials perfectly inert and uſeleſs in the paroxyſm. And yet the antiſpaſmodic powers of this mineral have been proved in epilepſy, and the opinion of Gaubius on its virtues has been juſtified by the experience of many other phyſicians. If it is uſed in Aſthma, it can be only as a means of counteracting the habit of convulſion diſcovered in the fourth ſpecies.

In the intention of removing ſpaſmodic conſtriction, a numerous liſt of antiſpaſmodics have been tried, ſingly and in combination, in the firſt ſpecies of Aſthma, with little advantage. Valerian, cardamine, camphor, muſk, caſtor, beladonna, tobacco infuſion, extract of henbane, fetid gums, cuprum ammoniacale have been given in various doſes, more or leſs complicated with other antiſpaſmodic or tonic medicines, and combined with opium in large and ſmall portions, but where mucus was to be expectorated, the paroxyſm was not ſuſpended, but frequently prolonged. In the dry Aſthma (ſecond ſpecies) I have not made ſo many trials, but I can affirm, that no antiſpaſmodic is ſo uſeful in the beginning as nauſeating doſes of ipecac. with diaphoretics, in the caſes which I have had an opportunity of treating.

In the acceſs of a paroxyſm of the firſt ſpecies, R. B. took four grains of ſolid opium, which produced nearly an apopletic ſtupor for two days. After a few hours, the moſt debilitating ſickneſs came on, with inceſſant efforts to puke. The labour of the reſpiratory muſcles was abated, but the wheezing evidently increaſed; a countenance more turgid than uſual, and intenſe head ache attended. The pulſe was increaſed in ſtrength and quickneſs for a few hours, but then ſunk into great weakneſs.

The paroxyſm ſhewed itſelf four hours earlier than uſual the next day, and two grains more were taken when it was perceived to commence; reſpiratory labour ſeemed again to abate, but the anxiety encreaſed to an alarming degree, as the ſtupor became ſomething leſs. The pulſe was now weaker, and frequently irregular. Looſe motions ſucceeded and a general ſweat. The energy of the paroxyſm then revived with exquiſite diſtreſs. A medical friend, who attended with great care to the progreſs of theſe trials, became alarmed, and endeavoured to promote puking, without effect. Bliſters were applied, and draughts of vinegar and pepper were given, interpoſed with ſtrong coffee and muſtard. The patient was at laſt brought back to a ſtate more uſual in former paroxyſms, but with every care, the exacerbations were no fewer than nine, before expectoration becoming gradually more copious, concluded the fit. Notwithſtanding the bad ſucceſs of this experiment, opium gr. ii. was uſed in another paroxyſm after an active vomit, and bad conſequences ſtill enſued, though not ſo extenſive. In the latter experiment, the extraordinary ſymptom of a moſt painful ſtrangury came on, which continued ſeveral hours.

Extract of henbane was ſubſtituted for opium, in ſucceeding trials, but with no better ſucceſs in the beginning or height of the paroxyſm. In the ſecond ſpecies this narcotic produced reſt when opium would not, but though the exacerbation was diſturbed, the paroxyſm was not ſhortened.

Muſk was given twice to a patient in the firſt ſpecies, in doſes of half a dram each. A perſpiration came out, but the anxiety and laborious reſpiration were not leſſened.—Camphor being added in equal quantity, heat was much encreaſed, with violent head ache, pain in the ſtomach, and ſpaſtic twitchings in the intercoſtal muſcles, but no relief to the breath. Plentiful dilution was uſed, and the extraordinary ſymptoms ſubſided. Camphor was joined with fœtid gums, in many inſtances without advantage, and where dyſpepſia was very predominant, theſe complicated forms always encreaſed the diſorder of the firſt paſſages.

It is in the fourth ſpecies, that antiſpaſmodics are given with deciſive effect, and I have little doubt of their general advantage, when that ſtate of Aſthma can be aſcertained to be eſtabliſhed. Vinegar, cordials and volatiles may be combined frequently with narcotics, but the ſtinking gums diſorder digeſtion, and alſo promote purging, which is not deſirable.

Opium and Æther are the moſt valuable of the claſs in this ſpecies, and their doſe muſt be proportioned to the neceſſity of the caſe. The judicious practitioner will frequently exhibit them in ſmall doſes, with as good an effect as from large ones, and will remember that a gigantic inſtrument applied unneceſſarily, may create gigantic fame without much eſtimable reputation attached to it.

Opiates are occaſionally uſeful after emetics and aperients, in any ſpecies of this diſorder.

Expectorants.—Theſe are a claſs of medicines uſeful in the firſt ſpecies of Convulſive Aſthma, in proportion as they are indicated. All practitioners are convinced of the neceſſity of applying them. Myrrh is certainly not an expectorant, however valuable as a ſtomachic. It has been of no uſe during the paroxyſm.

Ammoniac is a very valuable expectorant, but more ſo, if united with a ſaline menſtruum. A compoſition of this kind, is, however, likely to purge, if not prevented by opium. This gum alone, is too heating, and Aſſafœtida, which has been much recommended by Dr. Miller, is more ſo. He found it moſt beneficial when it puked the patient. His diſeaſe is not determined to have been the Convulſive Aſthma of adults, and the good effects which are deſcribed, have never reſulted from its uſe under my direction. It is alſo materially inconvenient to perſons who cannot be contented with a conſtant fœtor in the mouth, alvine diſcharges, and the air of the chamber.

The oily and demulcent expectorants, are not calculated for any ſpecies of Aſthma; the ſtomach of an Aſthmatic is ſufficiently diſordered without their additions.

Squills are very uſeful in the two firſt ſpecies of the diſeaſe. When united with vinegar, we obtain the medicine on which Floyer beſtows the greateſt applauſe. In many trials with vinegar of ſquills, I have ſeen great advantages from its exhibition, in the firſt ſpecies of Convulſive Aſthma. It is moſt uſeful at the commencement of the paroxyſm, and proportionably ſo, as it is attended with ſome little nauſea without diarrhæa. However much it may promote urine, this effect ſeems not to ſhorten the paroxyſm of Aſthma, whilſt its other powers have prepared the way for expectoration, and probably excited abſorption.

Vinegar of ſquills is alſo a good medicine in the ſecond ſpecies, but I have remarked, that its power over the paroxyſm is then only in proportion to its emetic, or nauſeating effect. In the third ſpecies, unleſs it vomits, I can ſee no uſe in the exhibition.

Oxymel is only efficacious, as it contains vinegar or ſquill. Honey or ſugar are too fermentable for any ſpecies of Aſthma, and frequently impede the operation of better medicines.

Decoction of ſeneka is uſeful in the Aſthma of old people, but in the paroxyſm of younger perſons, I have found it too heating.

All expectorants of heating qualities are improper in Aſthma, unleſs by combination with other ingredients theſe qualities are corrected, and it ſhould be recollected in their exhibition, that the ſtate of the ſtomach requires amendment. Nauſeating doſes will not exactly coincide in both intentions, but the effect of nauſea will be a gradual removal of the offenſive matters, which will be paſſed forward from the duodenum, and abſorbents, with bitters and expectorants, may then be purſued with greater advantage.

Bliſters between the ſhoulders, are not of deciſive uſe. Their application is generally accompanied by medicines which may promote expectoration without them, and the uſual length of the paroxyſm is not diminiſhed. When applied to the pit of the ſtomach, I have frequently thought the diſtention of that organ leſſened, and breathing has been more free. Expectoration has not, in my opinion, been clearly promoted by an application of bliſters to any part, in the paroxyſm of Convulſive Aſthma.

Inhaling Vapours.—Hippocrates claims the honour of introducing the inhalation of fumes from various herbs, and reſinous gums. He uſed herbs and nitre boiled with vinegar and oil, and directed the vapour of ſuch boiling compoſitions, to be drawn into the lungs through a proper pipe. This practice was extended in many directions, and upon various indications of diſeaſe, as may be found in many parts of his works.

Upon the indication of exceſs of ſerum, fumes were directed to be inhaled by practitioners, many ages after his time, for the purpoſe of drying the moiſture which was the cauſe of Aſthma, and alſo to carry off the remains of the obſtructing matter. Frankincenſe, myrrh, and many other gums, were in common uſe, with which arſenic was occaſionally mixed with dangerous and injudicious boldneſs. But this application of the mineral, aroſe from the miſtake of taking the gum juniper or vernix of the Arabians, which, by their medical authors, was preſcribed in fumigation, under the name of ſandarac, for the *σανδαράχη* of the Greeks, which doubtleſs was an arſenical mineral.*

Inhaling of fumes has been ſuggeſted by modern phyſicians both in Phthiſis and Aſthma. The vapour of Æther, raiſed in the ſteam of warm water, has been often inhaled from the inſtrument recommended by Mr. Mudge, but without advantage in Aſthma. In the firſt ſpecies, the ſymptoms were aggravated, as we may preſume, from the greater rarefaction of the air contained in the lungs, and the more conſiderable expanſion of the fluids in the pulmonary veſſels.

The inefficacy of æthereal vapour in Aſthma, may be anticipated by conſidering the advantage of inſpiring it in phthiſis, a diſeaſe of contrary indications: In which it is recommended by Dr. Pearſon, with the impregnation of cicuta. The vapour ariſing from hemlock leaves only, infuſed in boiling water, was once found ſerviceable in the ſecond ſpecies of Aſthma, but always injurious in the firſt. In the laſt kind, its narcotic quality may be ſuppoſed to recommend its uſe, but antiſpaſmodics directly taken into the ſtomach, will act with more deciſion, and render other means unneceſſary. If there are virtues in ſome herbs, calculated to promote expectoration, the vehicle of aqueous vapour is not favorable to their operation; heat and moiſture conveyed into the lungs, being more likely to encreaſe the diſeaſe than to give relief.

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* Vide Galen, Lib. IX.

Smoaking Tobacco is practiſed by ſome Aſthmatics, who miſtake the great excretion of ſaliva for a neceſſary evacuation. I am ſatisfied that a much more copious determination of lymph is made to the bronchia and ſalivary glands, by ſmoaking, and it is entirely conformable to the actions of the œconomy, if the habit of ſuch ſerous ſecretion becomes eſtabliſhed, though this exciting cauſe be abſent. I have perſuaded ſome Aſthmatics to abandon the practice, with great advantage, in the firſt ſpecies. The atmoſphere cannot ſupply the neceſſary demands for oxygen, ſufficiently faſt in the paroxyſm, even if the impurity of tobacco fumes is abſent.

Oxygen, *Hydrogen*, *Hydro-Carbonate*.—Thoſe who are beſt acquainted with pneumatic medicine, ſpeak in ſanguine terms of the effect of oxygen in Aſthma. "No ſooner "does it touch the lungs," ſays Dr. Beddoes, "than the livid colour of the countenance "diſappears, the laborious reſpiration ceaſes, "and the functions of all the thoracic organs "go on eaſily and pleaſantly again."

Many authorities confirm the fact of benefit being derived from the inſpiration of this air in Aſthma, but as there has been little diſtinction of cauſes, marking its ſpecies, pneumatic medicine has been tried from random indications, and hydro-carbonate and hydrogen are ſaid to be uſeful in Aſthma, as well as oxygen, though their properties are ſo different. Dr. Ferriar gives us an account of undoubted benefit, from the uſe of hydrogen in Spaſmodic Aſthma, but the diſeaſe is ſaid to have taken place after inflammations in the thorax and adheſions of the plura; it ſhould, therefore, be included in the continued ſpecies, from fixed cauſes. In a caſe of this kind, oxygen would probably revive pain and inflammation, from its ſtimulating properties, oppoſite to thoſe of hydrogen, which laſt could not be a permanent remedy.

In the firſt ſpecies of Convulſive Aſthma, I have no doubt of the advantage of uſing oxygen in the paroxyſm, and I am not leſs hopeleſs of a perfect cure from the continuance of this remedy only in the intermiſſion, though here too, it will aid the general means.

I am well acquainted with the return of the paroxyſm in two inſtances, after the moſt favorable expectations being entertained, from the relief afforded in paroxyſms of the diſorder.

In the ſecond ſpecies of Aſthma, I am informed by a phyſician of great accuracy and diſcernment, oxygen has appeared hurtful, encreaſing heat, anxiety, and even producing temporary fever, when the pulſe was previouſly under 90. Hydrogen and hydro-carbonate were tried without benefit, and the fit vaniſhed by moving out of town.*

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* I am obliged to Dr. Thomas Bree, for many trials of aerial medicines in Aſthma.

In the third ſpecies, where the firſt paſſages were affected with dyſpepſia, and the greateſt debility, oxygen was uſefully inhaled, though I cannot ſay what length of time was requiſite to produce the good effect; I am only informed that a patient "affected with con-"vulſive paroxyſms, belonging to this ſpecies, "enjoyed a better appetite, and ſuffered leſs "in the paroxyſm, after the inſpiration of "oxygen, as recommended by Dr. Beddoes, "than he was uſed to do."

It is not always poſſible to aſcertain if irritation of ſerum was abſent from the lungs in this ſpecies, when great acrimony offended the firſt paſſages, and had moſt influence in exciting the fit. But if oxygen is really a remedy for dyſpepſia, it may be uſeful in this ſpecies, by invigorating the arterial and abſorbent ſyſtems, and thus eventually promoting periſtaltic action, and a better aſſimilation of alimentary matter. It has been rendered probable by M. Hallé, that oxygen is principally inſtrumental in performing thoſe combinations in the inteſtinal canal by which aſſimilation is produced.*"

That it is uſeful in the paroxyſm of Aſthma, from irritation of mucus, may be deduced from a conſideration of every circumſtance of prediſpoſition to the diſeaſe, and ſtill more from the poſitive cauſe of the fit.

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* See La Medicine Eclaireé, &c. par M. Fourcroy.

Oxygen is a ſtimulating fluid, which being inſpired, may act directly upon the capillary orifices, and excite them to contract their apertures, and preclude the further exit of their contents. If its exciting qualities were to be applied to the arterial trunks only, they might propel the blood with unuſual force, and the capillary extremities not being equally excited, the diſeaſe might be more advanced: but in ſpeaking of this diffuſible and ſubtle fluid, we cannot adapt the reaſoning which would apply to other powers operating upon the œconomy of life; we are to conſider that it is a neceſſary conſtituent of the blood in its healthy ſtate, and we have facts to depend upon, which prove its ſalutary force in appeaſing the diſtreſs of a paroxyſm of Convulſive Aſthma.

We are alſo to conſider that it may be made to penetrate more extenſively, and deeply, into the air cavities, by artificially inſpiring it in greater proportion than can be afforded by a common atmoſphere, ſo that the points of vaſcular texture, uncovered by mucus, and not yet involved in ſerum, may be expoſed to a greater influence if they are fewer in number.

Its application gives to the pulmonary veſſels, and the heart itſelf, that invigorating impulſe which ſends the blood to the left ventricle, and the anxiety and ſtraitneſs, are in proportion diminiſhed: but it is carefully to be remarked, that expectoration ſtill terminates the fit, in greater or leſs proportion in the firſt ſpecies, which comprehends ſo large a majority of the cases of Convulſive Aſthma. See Sect. X. for additional reflections upon its uſe.*

As oxygen is a natural unaltered conſtituent of the blood, the ſhorteſt paſſage to its union with that fluid is the beſt. When it is inſpired the blood receives a ſupply as neceſſary as that of new chyle. Aſſimilation takes place by chemical decompoſition of atmoſpheric air in the lungs, when the ſupply of *oxygen* is received, and by decompoſition of particles of groſs mattter, when *chyle* is to be obtained; and as the lungs are a digeſting organ, as well as the inteſtinal tube, ſo they are alſo an emunctory for diſcharge of fœces, as well as the bowels, as appears from the conſtant neceſſity of exhaling carbon and vapour, and from the carbonated mucus which Aſthmatics, whoſe blood is morbidly replete with fecal parts, ſo commonly expectorate.

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* See the Revd. Mr. Townſhend's Guide to Health, Vol. I. for additional evidence of the uſe of oxygen in Aſthma.

Stomachics.—Theſe remedies are abſolutely neceſſary in Aſthma, to correct the predisſpoſing dyſpepſia, in the paroxyſm. Bitter tinctures are not to be uſed, but teſtaceous powders are generally beneficial. Acetous acid is particularly grateful to the ſtomach, and appears to correct the tendency to fermentation, at the ſame time that it excites abſorbing action, and invigorates the organ. It is obvious that cretaceous powders ſhould not be exhibited at the ſame time, but it is fully confirmed by experience, that both eminently counteract the flatulence and diſtention.

Additions of ſtimulant, or heating properties, are out of place until the third day, when the patient uſually begins to mend in the firſt ſpecies.

Generally ſpeaking, after the third day of the paroxyſm, any particular bitter, or cordial ſtomachic, muſt be very deſtitute of power, if it does not prove uſeful in all ſpecies of ſimple Aſthma.

The mixture propoſed by Dr. Griffiths, and Dr. Percival, of myrrh, kali, and vitriolated iron, is a ſtomachic, of great uſe when the prediſpoſition of Aſthma is to be cured.

Vinegar is the moſt uſeful medicine in the paroxyſm of the firſt ſpecies, which I have tried. In the acceſs of the fit it may be united with ſquill, ipecac. or emetic tartar. Afterwards, according to the progreſs, æther may be added in the firſt and the third ſpecies, in the ſecond it is too heating. When opium is given, it ſhould be united with this acid. Of nitre, in combination with vinegar, I have great hopes, but cannot ſpeak with any deciſion.

Vinegar would have been found much more uſeful than it has appeared to be in this diſorder, if it had been leſs combined with ſacharine and aceſcent ſubſtances. I have ſeen the paroxyſm, in many caſes of the firſt ſpecies, relieved by vinegar, ſimply united with water, when oxymel was uſeleſs or injurious.

The effect of this acid upon the lips, which it renders pale and ſhrivelled, ſeems to indicate a quality ſtimulating the abſorbing veſſels to encreaſed action, and it is thus that its operation in Aſthma is probably to be explained: there may be other reaſons given for its good effects, but not ſo clearly eſtabliſhed.

M. Achard,* found by experiment, that vinegar, of all ſolid or fluid perfumes, phlogiſticated the air the leaſt.

It is very obvious, that the profeſſors of pneumatic medicine, will find in its virtues additional proof of the truth of their diſcoveries. I aſſert its good effects in Convulſive Aſthma, but am not qualified to ſpeak of its *modus operandi.*

The uſe of Chalk in Aſthma ſeems to ariſe from the great diſorder in the ſecretions of the firſt paſſages. I conclude, that the capillary orifices of the ſtomach pour out a fluid in too great quantity, and the coats of the ſtomach being morbidly relaxed, the ſecreted juices require correcting, not leſs than the ſecretory veſſels demand ſome appropriate aſtringent to excite their contractions. Whether chalk anſwers this purpoſe or not, it is as advantageous in Aſthma of the two firſt ſpecies, and occaſionally in the ſecond, as it is in diarrhæa.

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* See Journal de Phyſique, par M. L'Abbé Roſier, Tome 26.

It has not, however, been generally the practice to uſe abſorbents, becauſe practitioners have hitherto merely looked at obſcure ſenſations of difficult breathing, without referring the natural indications which the phænomena afford to their true cauſes.

In Aſthma of the third ſpecies chalk has admirable effects; it ſhould be firſt given in a neutralized draught, after a gentle puke. Rhubarb ſhould be interpoſed, and after two days opium being added, will ſometimes prevent another exacerbation. I have even ſeen this effect produced on the ſecond day, but not without a previous evacuation from the firſt paſſages, and a very free uſe of chalk.

Stimulants.—The ſtimulants which have been introduced into practice, within theſe few years, with ſuch profuſe diſregard of the ability of the patient to bear them, have been applied in all ſpecies, and all ſtages of Aſthma. In the paroxyſm of every ſpecies in which the irritation is not diſcharged, their exhibition has frequently done miſchief, and not uncommonly induced a neceſſity of bleeding, which has been falſely referred to the natural indications of the diſorder.

Practitioners, entitled by their experience, to call out in the words of the Roman Poet; "*parce, puer, ſtimulis*," have been ſometimes ſeduced into theſe methods, but the injury of early raſhneſs is probably compenſated by the comprehenſive field of reflection, which is opened to the obſerving phyſician. An ignorant, or a thoughtleſs man, may not readily be corrected, and led back to paths of more ſecurity to his character, and the choice of a better judgement. The conſiderate ſtudent will make the *nocentia* the moſt important part of his inſtructive leſſons, and draw from them his beſt reſources of practice.

I have never yet ſeen æther give eaſe in the acmé of the paroxyſm of Convulſive Aſthma of the firſt ſpecies. In many trials the anxiety and the energy of reſpiatory labour were certainly encreaſed. If the irritation aroſe from repelled gout, the caſe is more ſuſſceptible of benefit from its uſe, but this caſe ſhould be diſtinguiſhed from thoſe of diſorders in the alimentary paſſages, which excite the paroxyſm in the third ſpecies.

The acrimony of indigeſted aliment, offending the ſtomach and duodenum, have certainly produced, in ſome ſubjects, the reaction of the ſyſtem in a paroxyſm of Aſthma, but here ſaline abſorbents are infinitely to be preferred, to the hot and ſtimulant draughts of volatile ſalts, æther, and ſtinking gums, the bad effect of which, is too often only diminiſhed, by the rhubarb or aloes which are fortunately united in the compoſition.

In the paroxyſm of Convulſive Aſthma, a writer of great authority recommends æther by tea ſpoonfuls, three or four times, to which he adds ten drops of laudanum. We have likewiſe a ſummary direction to apply a bliſter, to give an emetic, and to bleed. It is difficult to ſay, what natural ſymptoms can indicate ſuch contrary remedies, and we can only be ſatisfied, by reflecting, that Convulſive Aſthma has never yet been referred to its diſtinct and characteriſtic cauſes, and that the indications have in ſome ſpecies called for one plan, but in another precluded its adoption.

But though ſtimulants are miſplaced in the paroxyſm of three ſpecies of Convulſive Aſthma, they may be uſed with advantage in the fourth, if joined with opium, and poſſibly other narcotics.

They are alſo occaſionally beneficial in the intermiſſion of the firſt and third ſpecies, as a means of exciting digeſtion, and the general powers of the habit, particularly the abſorbing ſyſtem. The intention in which they are to be given will determine the phyſician in his choice.

Bathing.—Warm bathing is hurtful in every ſpecies of Aſthma. Not contented with probability, R. B. went into the hot bath both in the intermiſſion and the paroxyſm. The reſpiratory diſtreſs was much aggravated by the trial in the laſt ſtate, and the paroxyſm was excited in a few hours, and at an unuſual period by the trial being made in the former.

The cold bath has been recommended by Dr. Ryan, in Aſthma. I believe there is no ſingle remedy of more value in all ſpecies of the complaint, during the abſence of the paroxyſm. I can aſſert this upon numerous trials of its efficacy.

In the paroxyſm, R. B. went into a bath of forty-ſix of Farrenheit. It required ſome firmneſs to make the attempt, and more patience to bear the ill ſucceſs of it. The great abſtraction of heat was evidently injurious, and it was ſome hours before the impreſſion was ſo far overcome, as to take away fears of the conſequence.

It will ſtill be doubtful to ſome perſons, if cold bathing is not advantageous in the paroxyſm. I give my opinion upon trials made in very acute diſtreſs, and leave it to conſideration. When the patient has only dyſpnœa, he will perceive from its uſe internal vigour, and have ſenſations which ſeem to apply to the removal of prediſpoſing laxity of vaſcular fibres, from the greater ſtimulus after the abſtraction of a certain quantity of common heat, and by this means the cure is always to be attempted.

Tonics.—Tonic medicines, if we ſeparate a claſs of ſtomachics from this general head, are not expected to be uſeful in the paroxyſm of Aſthma. They have been applied partially, and abandoned capriciouſly, by moſt practitioners, in caſes of Aſthma during the intervals.

But a deſideratum has always been a proper diſtinction of ſpecific cauſes. If tonics are given in caſes of diſordered reſpiration ariſing from ſecret vomicæ, ſmall tubercles, adheſions of the pleura, and many other cauſes of Continued Aſthma, what conſequence can be expected, but encreaſe of diſeaſe, and accumulated miſchief? The recollection of every practitioner will enable him to allow, that inſtances of this complicated kind, have been confounded more or leſs with Convulſive Aſthma of noſologiſts, and when iron, or peruvian bark have been exhibited, theſe valuable medicines have met with unmerited diſgrace.

But, beſides this cauſe for the rejection of tonics, the want of firmneſs in continuing the uſe of them, when properly indicated, is a great ſource of their diſcredit.

A febrile affection comes on during a courſe of ſteel or mineral water, and the medicine is diſcarded never to be reſumed.

Peruvian bark loads the ſtomach, and brings on dyſpnœa in one preparation, and it is abandoned without trying another of lighter digeſtion, and more divided parts.

I can affirm, that in the intervals of the paroxyſms of the firſt, third, and fourth ſpecies of Aſthma, tonics are generally beneficial, and that a temporary inconvenience from the uſe of one form, ſhould incite the phyſician to find another, and apply it, never abandoning the general intention.

In the ſecond ſpecies their advantage is more doubtful, and their exhibition muſt be decided upon, by careful attention to remote cauſes.

In purſuing, conſiſtently, a courſe of tonic medicines in this diſeaſe, the phyſician muſt prepare his patient for the neceſſity of long perſeverance. A prediſpoſition is to be cured which conſiſts radically in laxity of muſcular fibre, and conſequently in feeble vaſcular contraction. This ſtate has been growing very probably for years, and the expectation of removing it in as many weeks or even months, is puerile and not to be defended.

It is almoſt as rational to promiſe, that a remedy ſhall confer upon the ſoft fibre of an infant muſcle, the premature denſity and tone of adult growth.

In the firſt and third ſpecies of Convulſive Aſthma, the practitioner may be ſafely referred to all medicines which belong to the claſs of tonics, which may be taken up and ſuſpended, or variouſly combined, according to his judgment. Too long uſe of one form diminiſhes its influence, whilſt another will continue the progreſſive impreſſion with additional force.

In the choice of tonics, the preparations of iron are to be preferred as eſſential means of cure. Theſe ſhould be occaſionally aſſiſted by bitters and peruvian bark, and the ſtate of dyſpepſia is never to be overlooked, but obviated by frequent interpoſition of abſorbents and rhubarb. Opium is alſo required to tranquillize occaſional uneaſineſs from the new excitement of preparations of iron. Oxygen is too well recommended upon principles cloſely connected with the prediſpoſition and remote cauſes of Aſthma, to omit its uſe, by modes of exhibition now generally known.

I have tried calcined zinc in ſeventeen paroxyſms, and more intermiſſions, without being able to diſcover the ſmalleſt advantage from its operation. In general it loaded the ſtomach, when given in a full doſe. The accounts which are received of its efficacy muſt be aſſigned partly to enthuſiaſm, and more generally to the want of diſcrimination of the ſpecies of Aſthma, and the erroneous interpretation of the cauſes which terminate the fit. Theſe are more or leſs dependent on the denſity of the atmoſphere, and changes in its degrees of purity, and frequently on the condition of the firſt paſſages hitherto greatly neglected in treating the diſeaſe.

SECT. XVII.

A plan of treatment traced out in the Paroxyſm *of each ſpecies.—General rules of diet for the paroxyſm and intermiſſion.*

IN a paroxyſm of Convulſive Aſthma, we are to conſider what ſpecies of the diſeaſe it belongs to, and next the indications which are to direct us in the treatment.

Paroxyſm of the Firſt Species.—The indications are to diminiſh the fullneſs of the pulmonary veſſels, by determining the blood to the ſurface of the body: to accelerate the paſſage of the blood from the right to the left ſide of the heart: to remove the extravaſated ſerum already preſent by abſorption, exhalation, and mucous expectoration: to correct dyſpepſia, and encreaſe the tone of the firſt paſſages.

In anſwering the indications of every ſpecies of Aſthma, we are to employ the inſtruments propoſed in the laſt ſection, with the practical cautions there recommended.

Gentle puking will afford inſtruction on the extent of dyſpepſia as a remote cauſe, and the paroxyſm will go on with milder exacerbation, if irritating matter is removed from the ſtomach and duodenum. Afterwards a draught with diſtilled vinegar ℥i. and pulv. ipecac. gr. iii. may be purſued every four hours, as a means of determining to the ſurface of the body, and promoting abſorption and exhalation. If coſtiveneſs prevails, it will be neceſſary to remove it, carefully avoiding purging.

Inſtead of acetous draughts with ipecac. the phyſician may ſee reaſon to prefer chalk, or magneſia uſta in a draught with the ſame nauſeating ingredient. The indication of diſorder in the firſt paſſages, will determine his choice.

To accelerate the paſſage of the blood to the left chambers of the heart, beſides theſe means, oxygen ſhould be inſpired, diluted according to the rules of Dr. Beddoes. In the morning no time ſhould be loſt in ſupplying the patient with clear coffee, as ſoon as he awakes, which ſhould be repeated at intervals with dry toaſt.

The patient ſhould alſo take during the remiſſion, a bolus of pulv. columbo, with tinct. opii a few drops, every three hours, and infuſion of coffee or camomile; the nauſeating draught being ſuſpended in the intervals of the exacerbations.

When the ſecond exacerbation commences, the nauſeating draught muſt be reſumed, at firſt to excite puking, and to be repeated afterwards without that effect. In the ſecond remiſſion, the plan of the former ſhould be reſtored. The third exacerbation will be probably mild, and the acetous nauſeating draught may be united with æther, and a proportion of opium. With this plan there will appear on the third day, a conſiderable tendency to expectorate, which ſhould be promoted by ammoniac, with vinegar of ſquill and tinct. opii, or with volatile ſalts. Ammoniac is called an expectorant, but the patient before this period, too frequently takes this nauſeous medicine without uſe.

From this time, bitter infuſions of myrrh, columbo, or quaſſia wood, may be given with great advantage, more or leſs united with abſorbent earths, magneſia, or vinegar. If the exacerbation ſtill returns in the evenings, it may be judicious to continue the nauſeating medicine at the hour of its attack, except in Aſthmatics, who, having frequently ſuſtained the paroxyſm, are very liable to be impreſſed by habit. When this is aſcertained, a conſiderable doſe of opium, with æther and volatiles, is the ſpecific remedy.

Paroxyſm of the Second Species. The indications are to remove the ſubtle and acrid particles, which have been received in inſpiration, or to involve them in mucus, which may guard the ſenſible membrane from their further irritation, and laſtly, to remove the patient from the ſphere of their influence.

The firſt intention is not readily accompliſhed, and whatever claims may be made to the honor of curing paroxyſms of this ſpecies, nature is often the patient's only friend. The irritating offence will naturally encreaſe the action of the bronchial veſſels, their lubricating lymph will be ſecreted to ſheathe the paſſages from further injury, and this event takes place without any thanks being due to art; it may be promoted by ſaline antimonial diaphoretics, and nauſeating doſes of ipecac. adding tinct. opii when the paroxyſm declines.

A change of the wind, may likewiſe ſave the phyſician every trouble in executing the laſt intention, but if this relief does not come, it is neceſſary to direct a different reſidence.

Paroxyſm of the Third Species.—The indications are to diſcharge irritating matter from ſome one of the hollow viſcera below the diaphragm.

The diagnoſtics, it muſt be confeſſed, are often difficult to aſcertain. But if the diſorder does not belong to this ſpecies of Aſthma, we muſt aſſign it to the firſt, and the ſame preliminary treatment with emetics, may be ſafely inſtituted. After one gentle emetic, an opinion may be formed with more preciſion, whether pulmonary irritation is preſent as well as abdominal, which may be diſcovered by the cough that attends in both. In the firſt ſpecies it is ſo ſmall and painful as to be ſuppreſſed by voluntary efforts. In this it is more open, but equally without expectoration, as in the beginning of the other.

The conſiderations, analogies, and facts of Sect. XIV. may direct the inquirer further in the diagnoſtics of this ſpecies.

It may be neceſſary, in ſome caſes well underſtood from former circumſtances, to give crude quickſilver triturated into a bolus with conſerve, or calomel with rhubarb, or hydrargyrus cum creta. But generally we are to purſue the moſt quiet means of opening the firſt paſſages, to diſcharge acrimony.

After a moderate evacuation, if the habit is inveterate of convulſive contractions, an opiate may be given with great propriety, but in young Aſthmatics, if the offence is only excited in the alimentary tube, the paroxyſm may be ſuſpended, or the exacerbation be ſo mild as not to diſtreſs the patient. Whether this ſtate is obtained by the operation of an opiate or not, abſorbent earths are eminently uſeful, and ſhould afterwards be continued through exacerbations and remiſſions, in a vehicle ſaline and bitter, and opium, with æther or not, may be added, as judgment may direct.

Paroxyſm of the Fourth Species.—The indications direct us to make ſenſation leſs acute, or by diverſifying impreſſions to diſſever the chain of perceptions, connecting themſelves in the mind with the primary cauſe.

To be correct in diſcriminating this ſpecies, is not always poſſible, but that there is reaſon for the eſtabliſhment of it, is proved by the analogy of all convulſive contractions; by paroxyſms returning upon ſo minute cauſes of offence, as to be traced with difficulty, and at laſt only through the links of mental aſſociation of ideas.

Here we ſee the uſe of opium, and other antiſpaſmodics; their influence on animal ſenſation prevents the impreſſion of ſlight cauſes, which are not likely to endanger a function, but which would excite the reaction of muſcular convulſions, without their exhibition in habits already diſtinguiſhed.

It is apparent that this affection may ſupervene upon the exacerbations, in each of the former ſpecies. Nature or art may have removed the irritating offence, but convulſive motions may ſtill continue, at greater or leſs intervals. In the firſt ſpecies and in the third, it may be pretty well concluded that the recurrence is owing to habit, if the patient is conſiderably improved in health; if dyſpepſia is greatly diminiſhed, and if expectoration and wheezing do not terminate the fits.

But no diagnoſtic is ſo ſtrong as the effect of medicine. Under authority of circumſtances, opium and æther may be judiciouſly ordered in large doſes, and in the alteration of ſymptoms which has been deſcribed, theſe antiſpaſmodics are inſtantly uſeful.

Diet.—The Aſthmatic ſhould avoid the *Errors of Diet* pointed out as exciting cauſes, Sect. X. His food ſhould not be generally fluid or weak.* In the ſecond ſpecies we have the neceſſity of providing for a diaphoreſis, but the ſtomach requires ſolids, even in that. Vinous drinks ſhould be avoided in the paroxyſm of the firſt ſpecies in particular, and watery gruels and broths are equally bad, taken largely. Whatever is ſtomachic is proper, if it does not ſtimulate. Acidulated water, milk and water with toaſted bread or biſcuit, rice boiled in broth until it is ſoft, without fat, are ſuited to the paroxyſm.

Infuſion of coffee may be conſidered medicinal, in every ſpecies of Aſthma except the ſecond, in which it is too heating for common uſe. It is beſt in the firſt and third ſpecies, in which dyſpepſia is ſo predominant, as to make the treatment of one not inapplicable to the other. Sir J. Pringle ſpeaks of it in the paroxyſm as a moſt powerful medicine, and directed it in the proportion of one ounce to a diſh, without mixture, and repeated every half hour. Dr. Percival gives his authority for the uſe of coffee in Aſthma, as a ſucceſsful means of relief. Sir J. Floyer uſed it with great benefit in the latter part of his life, as appears from the account of Dr. Muſgrave.

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* It is doubtful if fluids are eaſily digeſted, though their thinneſt parts are copiouſly abſorbed. See Mr. J. Hunter, Obſervat. on Digeſtion, p. 218.

If coffee is boiled it loſes part of its flavour, it ſhould, therefore, be infuſed like tea, by pouring boiling water upon it in a cloſe pot.

From the cloſe of one exacerbation to the beginning of the next, a more cordial aliment may be uſed, but not ſo exciting as in the intermiſſions of the paroxyſm. Coffee and ginger tea are the moſt cordial articles which ſhould be allowed. Hot liquors are always improper; cold water is taken with great benefit, and if acidulated with vinegar, its good effects are often more conſiderable.

It is particularly neceſſary not to oppreſs the ſtomach by more than it can govern: but it is not leſs important in an advanced ſtate of the diſeaſe, to ſupply the ſtomach with tender animal food and light wine. Examples of this kind are numerous, but a ſpecimen of the cordial diet is given with clear evidence of advantage, by Dr. Whytt.*

The practice of taking rich ſoups, and broths, is very injudicious in all ſtages of Aſthma. The veſſels are both filled and relaxed by ſuch a diet, and the ſtomach is not improved by their uſe. To be more particular would be a repetition of the cautions as to *Errors of Diet*, in Sect. X.

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* Obſervat. &c. on the Cure of Nervous Diſorders, p. 502.

SECT. XVIII.

The Prediſpoſition removed and the diſeaſe cured.—Examples of the practice.—Concluſion.

WHEN the paroxyſm has ſubſided, we are to proceed with a further application of remedies indicated by the remote cauſes. This part of the practice has been little attended to,* though it is only by removing the prediſpoſition, that the diſeaſe can be cured.

It is our duty to urge the neceſſity of counteracting exciting cauſes, and to ſhew what condition of body it is, in which theſe cauſes are ſuffered to operate their effects. Unleſs this honeſt ſolicitude of the phyſician, is anſwered by the firm ſubmiſſion of the patient, the latter cannot become impervious to the future attacks of Aſthma, though a paroxyſm has terminated in the moſt perfect intermiſſion.

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* See Tonics in Sect. XVI.

The reader has anticipated the plan of cure, if he has attended to the prediſpoſition and exciting cauſes of the firſt ſpecies, which makes ſo large a majority of caſes. He is referred to Sect. XI. XII. XIII. XIV. where the *nocentia* are generally explained, and counteracting means are to be deduced. The remedies of the 16th ſection may further aſſiſt his views, if he particularly notices oxygen, ſtomachics, and tonics.

In the firſt ſpecies it is obvious, that the proper indications are to be only anſwered by the uſe of medicines, which can give a contractile tone to the pulmonary capillaries, encreaſe the power of the ſtomach and bowels, and promote abſorption and ſtrength through the whole habit.

Peruvian bark, iron, cold bathing, exerciſe, change of air, oxygen, bitters, abſorbents, and acids, theſe are the means, which, diverſified according to their effects, will prevent the recurrence of paroxyſms, by curing the condition of body in which they are excited.

We muſt continue abſorbents from the cloſe of the paroxyſm, making uſe of magneſia when the body is coſtive, but preferring chalk in common inſtances. This medicine, given in bitter infuſions, will oppoſe dyſpepſia as a temporary relief, but muſt not be relied upon for a more extenſive advantage. The preparations of iron are to be given at firſt in ſmall doſes, and afterwards encreaſing the quantity. If heat, or pain, occaſionally attend, we muſt ſubmit during theſe ſymptoms to ſuſpend their uſe, and ſubſtitute ſaline draughts with opium.

Upon the *terrentia* of the paroxyſm appearing, their exhibition muſt be again ſtopped, and the plan purſued which has been pointed out in the laſt ſection.

Every preparation of iron may be uſed in the intervals of the paroxyſm, but the rubigo ferri is preferred. The directions which are given by Lewis and Cullen, and other writers, on the metaria medica, are well known, and ſhould be generally obſerved in preſcribing this mineral.

I have many proofs of ſucceſs from a patient continuance of this plan of treatment, but a ſhort example is enough.

A clergyman, 48 years old, had been ſubject ſince his thirtieth year to this ſpecies of Aſthma. I had ſeen him in two paroxyſms, and after the laſt I ſucceeded in engaging his attention to a courſe of medicine to prevent a return. A powder of crab's claws, rhubarb, and pulv. anomat. was directed every day after dinner, and to be repeated oftener, if flatulence of the ſtomach came on. I alſo preſcribed as follows: R. Ferri Vitriol. gr. x. Extracti Chamæm. ʒiſs. Ol. Cinnam. Gutt. iv. Pil. xxx. He took three of theſe pills twice a day, with infuſion of columbo root and ginger, for ſeveral weeks, when the paroxyſm returned. At the cloſe he reſumed them. After a few days they were changed for rubig. ferri, twice a day, and rhubarb every night, and the cold bath was uſed every day; his diet was more cordial, and porter was indulged in, medicine was occaſionally intermitted, and frequently changed into other forms of the ſame claſs. He likewiſe bathed in the ſea for ſeveral weeks. He was uſed to ſuſtain twelve paroxyſms in the year, but he has been free from them two years, and carries every mark of health, with a perfect freedom of digeſtion and breathing.

In the *Second Species*, exhalation ſhould be promoted from the veſſels of the lungs, by the uſe of diaphoretics. Small doſes of opium are uſefully conjoined, and the patient ſhould not be ſubjected to the influence of irritating cauſes, ſuch as are known to exiſt in towns and manufactories.

The Dry Aſthma ſeldom occurs under the diſtinctions before marked out. It is not a diſeaſe of ſuch dangerous debility as the firſt, but it is more ſubtle and capricious in its attack, and leſs uſefully influenced by the action of tonics, which may frequently be injurious by encreaſing dryneſs of the pulmonary membrane, and laying it more open to offence. It may be ſeen in the progreſs of convaleſcence from the firſt ſpecies, and is then an indication of tonics having performed their part, and of the propriety of ſuſpending them. After many repetitions, the paroxyſm or exacerbation, may depend only upon the principles producing the fourth.

A gentleman had been many years ſubject to this ſpecies of Aſthma, which uſually terminated in ſome expectoration, and when the tracheal paſſages became moiſt the paroxyſm began to ſubſide, at length he left a populous town on account of the frequent returns, and went into country lodgings only one mile diſtant. He was free from his complaint, except the wind blowed from the town, which brought on a paroxyſm in two hours from the change, in ſix inſtances. When the wind blowed from the country, although eaſterly, the paroxyſm ſoon ſubſided, He removed two miles further, and in this ſituation loſt his complaint, taking ſmall doſes of opium and abſorbents, which prevented irritation from very ſlight offence, and corrected his digeſtion which was faulty: but the grand means appeared to be a ſituation more remote from the origin of effluvia, which could not arrive at his lungs, but in ſo diluted a ſtate as to loſe their influence,

The *Third Species* is to be cured by the means propoſed in the firſt, but with a more free uſe of abſorbents, and a more rigid attention to diet. Chalk and Opium will aſtoniſh the Aſthmatic, by the excellence of their effects, when the irritation proceeds from dyſpepſia of the firſt paſſages only. Of irritation in the uterus an example was given in Sect. XIV. I have no doubt of acrimony in the ſtomach, and duodenum gradually accumulating until a paroxyſm is frequently excited without other irritation; but more extenſive obſervation, with referrence to the principles here laid down, is neceſſary to arrange diſtinctly the diagnoſtics of the firſt and third ſpecies. I have frequently given Cretæ ppt. ʒſs. Tinct. Opii Gutt. xv. Ætheris Vitriol. Gutt. xl. three times a day, to a patient who had ſuſtained paroxyſms of Convulſive Aſthma preceded by puking, flatulence, acidity, and other ſymptoms of a diſordered ſtomach. This medicine delayed the returns, and a courſe of iron, with other tonics, was purſued with great ſucceſs in confirming the habit, and curing the diſeaſe, if the abſence of the paroxyſm for ſix, four, and three times the length of former intermiſſions, can vindicate this concluſion. I infer, from the efficacy of this medicine, that the cauſe muſt have exiſted in the firſt paſſages, but if the facts to which I appeal can be explained otherwiſe, I relinquiſh my theory without regret; but not without again adverting to thoſe principles of the animal œconomy regulating muſcular contractions, which were explained in Sect. XIV.

The *Fourth Species* muſt be attempted upon principles ſuggeſted in Sect. XV. The application of which will not be difficult when the diagnoſtic is well eſtabliſhed by the effect of antiſpaſmodics, and the progreſs of certain convaleſcence. The influence of external impreſſions muſt be maturely conſidered. Tonics have frequently removed debility from the Aſthmatic, and a change of perceptions, aided by the uſe of opium, to abate ſenſibility of ſlight irritations, would have ſecured him from relapſe if the exertion had been recommended, or its neceſſity foreſeen. A neglect of theſe means may be conſidered in many inſtances as the cauſe of recurrence of muſcular convulſions of the organs of reſpirations. This truth might be ſupported by the evidence of ſeveral caſes within my knowledge, but I ſhall give the following as an example particularly under my obſervation.

R. B. enjoyed general health in various ſituations until 1783. When dyſpepſia firſt attacked him at 25 years of age. The ſymptoms encreaſed gradually for four years. He was hypochondriac, ſleepy after meals, and had conſtant pains in the intercoſtal muſcles.

1788.—Reading was painful, his eyes conſtantly inflamed; a ſtupor came on every night, and apoplexy was apprehended. He had lived upon a very weak and fluid diet, and taken ſaline medicines very injudiciouſly.

In the ſummer, after awaking in the morning, he perceived ſome wheezing in his expirations, but no dyſpnœa.

In the autumn, after a catarrh, and fatigue in riding, he was ſeized in the uſual manner, with a paroxyſm of Convulſive Aſthma of the firſt ſpecies.

In the winter, he had ſeveral paroxyſms, and purſued the means of alleviating them, pointed out in the preceding ſections. His experiments frequently prolonged their duration, and the intermiſſions were neglected.

For four years this diſeaſe preſerved its character, and was remarkably excited by the following remote cauſe:—The elevated flat of Solyhull is the higheſt part of Warwickſhire, from which rivulets deſcend to the eaſtern and weſtern oceans. The ſoil is gravelly, but always moiſt with ſprings; the air is light, and continual evaporations make it cold. He was frequently called to this ſpot by the ties of family, or motives of buſineſs, from a reſidence forty miles diſtant, and two hundred feet nearer to the level of the ſea. In his firſt viſit, after he had ſuſtained the Aſthma, he was ſeized with a very ſevere paroxyſm on the evening of his arrival. He was laid up during his ſtay, and the ſymptoms had not ſubſided when he purſued his road back. As he deſcended from the high country into the rich paſtures of Leiceſterſhire, the dyſpnœa gradually went off, notwithſtanding great fatigue. During four years he repeated this viſit in warm and cold weather, and under all circumſtances, ſeven times, but with the ſame bad ſucceſs in every attempt.

1792.—He had tried the effect of numerous remedies in the paroxyſm, and had attained ſome advantage over it.* Dyſpepſia was leſs, and his general health improved, but he had not yet ſucceeded in lengthening the intervals.

He now purſued, more vigorouſly, the plan which he had adopted. He took iron in large doſes, and in all preparations, but preferred the ruſt, which corrected dyſpeſia moſt powerfully. He went into the cold bath every other morning, and took abſorbent earths frequently with bitter infuſions, and rhubarb.

In the ſummer dyſpepſia was greatly abated, and the intermiſſions became longer. In October he went to Bath, and drank the water a few weeks with great benefit. Upon his return he reſumed his tonics, and truſted chiefly to the ruſt of iron, taking chalk more ſeldom. The cold bath was ſuſpended in the winter.

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* See the two preceding Sections.

1793.—Some boils had appeared in the laſt year, and they were now more frequent upon his face and body. The paroxyſms did not come on ſo often, but were excited by fatigue or cold, and by profeſſional buſineſs, which he now determined to abandon, rather than his hopes of a perfect cure.

1794.—In the winter he was very free from diſordered reſpiration, which he attributed to excurſions and change of ideas, in new purſuits. In the ſpring he had two ſevere returns, excited by duſt of oats and hair powder, which revived dyſpepſia and gloomy proſpects. But he expectorated little, although dyſpnœa ſubſided with the paroxyſm. His diſeaſe now approached the character of the ſecond ſpecies, and the change was conſidered favourable. He alſo applied the principles of Sect. XV. to theſe attacks, and ſecretly determined to oppoſe a future invaſion by ſedatives which he had long diſcarded as uſeleſs in this intention,

An opportunity occurred twenty days after, when he completely ſtopped the paroxyſm at its commencement, by two grains of opium diſſolved in vinegar with æther. He enjoyed a good night, and aroſe in the morning without dyſpnœa or expectoration.

He was now prompted to ſee the event of a journey into Warwickſhire, but here the paroxyſm came as uſual on the evening of his arrival, when his mind was occupied by the perceptions which he had before experienced in the ſame place, and which he had great anxiety to avoid. When he perceived the ſymptoms, he withdrew from company, and took a draught of cold water and vinegar with forty drops of tinct. opii. Relief ſoon came, but not extended to a perfect removal of the affection, which he attributed to the ſtrength of influences operating upon habit.

The doſe of opium was repeated, and he had a good night, but no ſleep; in the morning dyſpnœa without wheezing. Further reflection ſtrengthened his opinion that he was now under the dominion of a ſecondary diſeaſe eſtabliſhed in habit, and he determined to anſwer the *new indications*, at any expence of effort which circumſtances might demand. He recollected the aphoriſm of Hippocrates on the convulſive diſeaſe of epilepſy, which had been dilated in the doctrines of many modern writers applied to cuſtom or habit, but not with the force which has been ſince exhibited by the author of Zoonomia.

Military buſineſs was moſt oppoſite to his former habits, and moſt likely to turn the current of his ideas, to diſſever the chain of links by which they revived old ſenſations, or to obliterate their influence. Exerciſe near the ſea, where the denſity of the air might co-operate with other means of cure, and the opportunity of bending his mind to the principles of a new ſcience, were his motives for taking a company in a regiment of militia, commanded by excellent officers, who were his friends.

At the end of June he joined his regiment, encamped upon a dry common, elevated above the plain, and ſloping towards the ſea at a few miles diſtance. The Colonel of this regiment is a father to his officers, and he permitted him to occupy lodgings, with his family, in the vicinity of the camp. He at firſt avoided, with great care, errors in diet, which are exciting cauſes copiouſly provided at military tables. But after a few weeks he found great caution was unneceſſary, an accidental exceſs having no bad conſequence. He ſoon gave his whole attention to the ſcene before him, and attempted to fill his mind with the images which it preſented. A new ſyſtem of tactics being ordered for practice of the regiments in camp, he employed himſelf in aſſiduous ſtudy of its principles and their application to active ſervice.

During the ſummer, and until late in the autumn he had uninterrupted health. The vigorous ſpring of elaſtic youth again animated his frame, and was attended by ſatisfaction and ſerenity of mind, which the capricious tyranny of his diſorder had denied him for the preceding ten years. He generally aroſe at four in the morning, and frequently marched ſix miles, in the duſt of two brigades of infantry, to be reviewed under a burning ſun, and was on foot until noon before he returned to camp. When this duty was not executed, exerciſe was purſued in the camp ground, become equally duſty as the road, but neither cough nor dyſpnœa was excited. Dyſpepſia and hypochondriaciſm were equally overcome: Liberties were taken with every ſpecies of diet: No exertion ſeemed too conſiderable, and fatigue was never felt. At the cloſe of the campaign he ſlept conſtantly in camp, and torrents of rain, which filled the tents with wet, and flowed through a knightsbridge houſe, which he was favoured with, produced no alteration for the worſe.

1795.—The regiment was cantoned in the towns of Cambridgeſhire during the winter, and he had no return of Aſthma.

In March he had orders to take three companies under his command, and to follow other diviſions of the regiment to Hull. He was now ſo confirmed in health, as to determine upon finiſhing his military experiment, when this duty was diſcharged.

Yet at Huntingdon, having taken cold and drunk bad wine, he had the *terrentia* of his diſeaſe, but the progreſs of the ſymptoms was ſuſpended by opium, and finally carried off in a bilious diarrhœa.

At the end of the month, fully ſatisfied with the ſucceſs of an uncommon experiment, he reſumed his regular profeſſion, and to the preſent period, (July, 1797) has felt no ſymptom of his former complaint, A ſlight dyſpnœa, came on with unuſual exerciſe and heat laſt September, and went off in a bilious diarrhœa without taking the form of Aſthma. But what are the proofs of a perfect cure in this diſeaſe capable of ſo long intermiſſions?

He has reſided in Birmingham ſince Auguſt, 1795, a ſituation of nearly equal altitude to that where he always met with a paroxyſm ſince he knew the diſeaſe, and only ſeven miles from it.

The air is much rarified by numerous fires, and a population of 80,000 inhabitants, with particles of duſt perpetually floating from the manufactories. He is, however, not ſo imprudent as to abandon preventive means.

In the ſummer he uſes the cold bath frequently. If flatulence diſturbs his ſtomach, he oppoſes the firſt ſymptoms of growing diſorder, by abſorbents, and bitters, always concluding this occaſional plan by ſteel, for ſeveral days, though the ſymptoms ſoon leave him. After a catarrh he takes the ſame care to recover the tone of the pulmonary veſſels and ſtomach; and with theſe attentions he has no apprehenſion of the diſeaſe returning, although the exciting cauſes are ſo ready to act.

Much more may be ſaid upon Diſordered Reſpiration, but febrile affections of the lungs are to be conſidered, upon principles diſtinct from thoſe here advanced. As to the forms of Continued Aſthma, they require no new comment, unleſs inſtruction was intended for practitioners of both ſexes, which I do not profeſs to give.

We have purſued our Inquiry on Convulſive Aſthma to a CONCLUSION. If its ſpecific cauſes afford the indications which are conſulted in the practice, we affirm, that the practice correſponds to the indications which the cauſes preſent, and embraces the beſt means of alleviating the paroxyſm or curing the diſeaſe.

It is, however, impoſſible to diſtinguiſh here, the nice contra-indications, and converſions of ſymptoms, which may occaſionally demand clinical attention. No written rules will ſupply the defect, which, in this diſorder, as well as others, the ſagacity and obſervation of experience can alone remedy. The general lines which are given muſt be conſidered as ſignals, which may be applied to, as judgment acting upon neceſſity may prompt, but which we confidently affirm ought never to be deſerted.

FINIS.